CHARLES UNIVERSITY

FACULTY OF PHYSICAL EDUCATION AND SPORT

DEPARTMENT OF PHYSIOTHERAPY

CASUISTIC OF A PATIENT WITH HEMIPARESIS

Bachelor Thesis

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Declaration

I declare that this Bachelor Thesis has been entirely based on my own individual work and practice from 04.01.2010 to 15.01.2010, with an additional visit on 21.01.2010.

The practice took place at Facultni nemocnice Kralovské Vinohrady (FNKV), at the Klinika rehabilitačního lékařství, which is the rehabilitation department for in- and out-patients.

Additional information that has been included in this Bachelor Thesis has been taken from the list of literature located at the end of this Thesis.

Prague, August 2010

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Acknowledgement

With the deepest gratitude I wish to thank every person who has supported me throughout my Bachelor studies at FTVS, Charles University.

I would also like to acknowledge and express my gratitude to my advisor, Mgr. Vendula Ježková, for her patience and guidance during these two weeks of practice at Facultni nemocnice Kralovské Vinohrady, as well as to my supervisor, PhDr. Jitka Čemusová, Ph.D, who has advised and guided me through my Thesis.

At last but not least, I am grateful to all my teachers and professors at Fakulta tělesné výchovy a sportu, Charles University, for generously sharing their knowledge both theoretically and practically.

Mandeep Bains
Prague, August 2010

Contents

1. Abstract

Title: Casuistic of a patient with hemiparesis

Kazuistika pacienta s pravostrannou hemiparesou

Thesis aim: This Bachelor Thesis is based on rehabilitation of a patient with hemiparesis, in this case on a patient's right side of body.

The general part covers the neurological point of view and the variant types of paresis. Further is a brief chart which gives order to the clinical findings when there is lesion in the motor system. Detailed symptoms and characteristics for hemiparesis are included as well as a treatment proposal. Since the patient has several diagnoses, there is also included a brief description of transversal spinal cord lesions/paraplegia and facial palsy.

The special part consists of the data collected under my two weeks of practise at the rehabilitation department at FNKV. Here I had a patient with hemiparesis, which I followed for 8 days. The result is concluded from these 8 days after therapy applied on the patient.

*Clinical findings***:** The patient is a 44 year old female which had a car accident in July 1997. The accident caused transversal spinal lesion in Th12 and paraplegia of lower extremities and she now use a wheelchair for transport. Patient is also diagnosed for hemiparesis and has a spastic right upper extremity. She also has facial palsy on her right side of face.

Methods: The therapy included 17 sessions during two weeks, two-three sessions each day except Fridays where she only has one. The sessions were performed between 8 and 10 in the morning and 13-15 in the evening. The sessions typically included strengthening, relaxation and stretching and various other physiotherapeutic approaches mainly of her right upper extremity. Relaxation is also provided on left upper extremity due to overload.

Result: The patient improved slightly during the two weeks, and showed progression by providing exercises more precisely. The patient has now started to use her right hand which will give her left overloaded upper extremity some rest. It is hard to give any comment on the spasticity because it changes from day to day.

Key words: Hemiparesis, Spasticity, Muscle hypertonicity, Passive muscle elongation, Vojta reflexive locomotion, Proprioceptive Neuromuscular Facilitation, Neurophysiologic exercises, Post Isometric Relaxation, Myofacial technique, Mobilization of periphery.

2. Preface

The Bachelor Thesis is divided into two parts, the general and the special part.

In the general part is theoretical and is a neurological point of view of sign and symptoms in upper motor neuron lesion and lower motor lesion. I have included a chart which briefly compares differences in symptoms when there is lesion in different areas of the brain. I continue going more specific into different types of paresis which includes; monoparesis, paraparesis, tetraparesis/quadriparesis and hemiparesis. Further I specifically focus on the hemiparesis and its physical signs and visible symptoms. I also mention the therapies used for hemiparetic patients. At last I included a brief theory about two of patient's other diagnosis, transversal spinal lesion and facial palsy.

The special part includes the anamnesis, initial kinesiological and the final kinesiological examination, with all its belongings. Further on is the conclusion of findings, rehabilitation plan and applied therapy for each day in details, evaluation and prognosis.

3. General part

3.1 Pyramidal and extrapyramidal tracts

The pyramidal tract refers specifically to the corticospinal tract. [(5)] It is a collection of axons that travel between the cerebral cortex of the brain and the spinal cord. The corticospinal tract mostly contains motor axons. It actually consists of two separate tracts in the spinal cord: the lateral corticospinal tract and the anterior corticospinal tract. An understanding of these tracts leads to an understanding of why for the most part, one side of the body is controlled by the opposite side of the brain. [(9)]

The extrapyramidal tracts refer to all the descending tracts other than the corticospinal tracts. [(5)]

3.2 Upper motor neuron lesions

Lesion of the corticospinal tracts (pyramidal tracts)

The Babinski sign is present when there is lesion of the corticospinal tract. The great toe becomes dorsally flexed, and the other toes fan outward in response to scratching the skin along the lateral aspect of the sole of the foot. The normal response is plantar flexion of all toes. The explanation is that the corticospinal tract plantar flexion of the toes in response to sensory stimulation of the skin of sole. When the corticospinal tract is nonfunctional, the influence of the other descending tracts on the toes becomes apparent as a response.

The superficial abdominal reflexes are absent. They abdominal muscles fail to contract when the skin of abdomen is scratched. This reflex is dependent on the integrity of the corticospinal tracts, which exert a tonic excitatory influence on the internuclial neuron.

The cremasteric reflex is absent. It the cremasteric muscle fails to contract when the skin on the medial side of the thigh is stroked. This reflex is dependent on the integrity of the corticospinal tracts, which exert a tonic excitatory influence on the internuci neurons.

There is loss of performance of fine skilled voluntary movements. This occurs especially at the distal end of the limbs. *(5)*

Lesion of the descending tracts other than the corticospinal tracts (extrapyramidal tracts)

Severe paralysis with little or no muscle atrophy is present. The muscles are spastic or hypertonic. The lower limb is maintained in extension while the upper limb is maintained in flexion. The deep muscle reflexes are exaggerated and clonus may be present in the flexors of the fingers, the quadriceps femoris, and calf muscles. The clasp-knife reaction is present when passive movement of a joint is attempted. Then there is resistance owing to spasticity of the muscles. The muscles, on stretching, suddenly give way doe to neurotendinous organ-mediated inhibition.

To have an organic lesion that is restricted only to pyramidal tracts or only to the extrapyramidal tracts is rare. Usually, both sets of tracts are affected to a variable extent, producing both groups of clinical signs. As the pyramidal tend to increase muscle tone and the extrapyramidal tracts inhibit muscle tone, the balance between these opposing effects will be altered, producing different degrees of muscle tone. *(5)*

3.3 Lower motor neuron lesions

Trauma, infection (poliomyelitis), vascular disorders, degenerative diseases, and neoplasms may all produce a lesion of lower motor neuron by destroying the cell body in anterior gray column or its axon in the anterior root or spinal nerve. LMN lesion can cause flaccid paralysis of muscles which are supplied, atrophy of muscles which are supplied and loss of reflexes of muscles supplied. Muscular facilitation is twitching of muscles which are only seen when there is slow destruction of the LMN cells.

Muscular contracture is a shortening of the paralyzed muscles. It occurs more often in antagonist muscles whose action is no longer opposed by the paralyzed muscles. [(5)]

Clinical findings when lesion in the motor system:

This table shows briefly the regions involved in causing paresis and also the symptoms of each area.

	Power	**Tonus**	**Coordi-nation**	**Movement disorders**	**Tendon reflexes**	**Plantar-response**	**Sensory deficit**
Direct activation system	Reduced	Hypotonic	Normal	No one	Hypoactive	Babinski	No one
Supra-nuclear system (direct + indirect)	Reduced	Hypertonic (spastic)	Normal	No one	Hyperactive	Babinski	Often present
Basal nucleuses	Normal	Hypertonic (rigid) or hypotonic	Slow, movement disorder	Hyperkinesias or hypokinesia and tremor	Normal	Normal	No one
Cerebellum	Normal	Hypotonic	Ataxia	Tremor	Normal or hypoactive	Normal	No one
Motor neuron	Reduced	Normal Or hypotonic	Normal	Fasciculation	Normal or hypoactive	Normal	No one
Peripheral nerves	Reduced	Hypo- or normal tone	Normal	No one	Hypoactive	Normal	Often present

Muscles	Reduced	Normal tone (or hypotonic)	Normal	No one	Normal	Normal	No one

Table 1, Clinical findings when lesion in the motor system [3]

3.4 Types of paresis

Monoparesis

Monoparesis is weakness or paralyses of muscles in one extremity. Monoparesis without muscle atrophy is often caused by small lesions of the motor cortex due to thrombosis or emboli. Multiple sclerosis and interspinal tumor can also causes flaccid weakness of the contralateral face, hand or leg. An upper motor neuron lesion has positive signs for spasticity, hyper reflexes and the Babinski sign. [3] In this case there is no spasticity, only a positive Babinski sign, because the UMN paresis is cause by an isolated lesion of the primer motor cortex (area 4). It may be difficult to determine by examination alone whether mono paresis is of upper or lower motor neuron type. [4]

Monoparesis with muscle atrophy is more frequent then monoparesis without muscle atrophy. Muscle atrophy can also be caused by not using the extremity for a long period of time, but this type of cause is more rear then lesion of the peripheral motor neuron. The tendon reflexes and the neurophysiologic examinations are normal in the case atrophy, cause d by inactivity of an extremity. Paresis of an arm with muscle atrophy is usually caused by lesion of brachial plexus or poliomyelitis, while monoparesis of one lower extremity is mostly caused by lesion in medulla spinalis, like multiple sclerosis, cauda equine or lumbosacral plexus. Spinal disc herniation does not affect all muscles of an extremity. Diseases in peripheral motor neuron can unnerve muscles which results in atrophy and reduced tendon reflexes and further can develop fasciculation. The diagnosis can be determined by neurophysiologic tests such as EMG and neurography. [3]

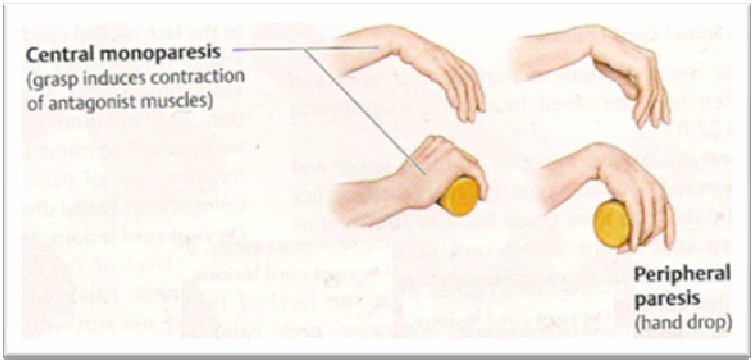

Fig 1, Central and peripheral monoparesis [4]

Paraparesis

Paraparesis is muscle weakness of both legs, lower extremity. UMN lesion causes a spastic paraparesis. Paraparesis in an acute stage can be difficult to differentiate from a peripheral paresis because of the spinal shock with decreased reflexes and muscle tonus. When affecting the medulla spinalis, caudal hypo sensibility is caused in the level of bladder and intestine innervations. Lesion around conus or cauda equine gives paraplegia and effect the function of bladder and intestine.

Diseases of the peripheral nerves, such as polyneuropathy, results as weakness, usually in distal part of the body. [3]

Fig 2, Spastic paraparesis [4]

Tetraplegia

Tetraplegia is muscle weakness affecting all four extremities and is caused by extensive bilateral lesion involving both the cerebral cortex and the underlying white matter, possibly extending into diencephalon. [4]

Lesion of medulla spinalis cranially to C5 cause spastic tetraplegia, while lesion caudally to the cervical medulla results in tetraplegia with weakened paresis of upper extremities and spastic paresis of lower extremities. [3]

Hemiparesis

Contralateral hemiparesis

Hemiparesis is weakness of arm, foot and half side of face on the same side of body.

A spastic hemiparesis can be caused by a lesion of the cortical motor area, capsula interna, midbrain or medulla spinalis (Cranially for C5). The level of lesion can be determined from patient's neurological condition. [3]

Lesions of the internal capsule cause spastic contralateral hemiparesis of leg and arm. Involvement of corticopontine fibers cause (central) facial paresis and impairment of corticobulbar fibers causes dysphonia and dysphagia. Sensory disturbances are also usually present. [4] Cortical lesions can generally also cause epileptic shock, aphasia, astereognosis or neglection. A hemiparesis caused by hemisphere lesion ofte cause visual defect. [3]

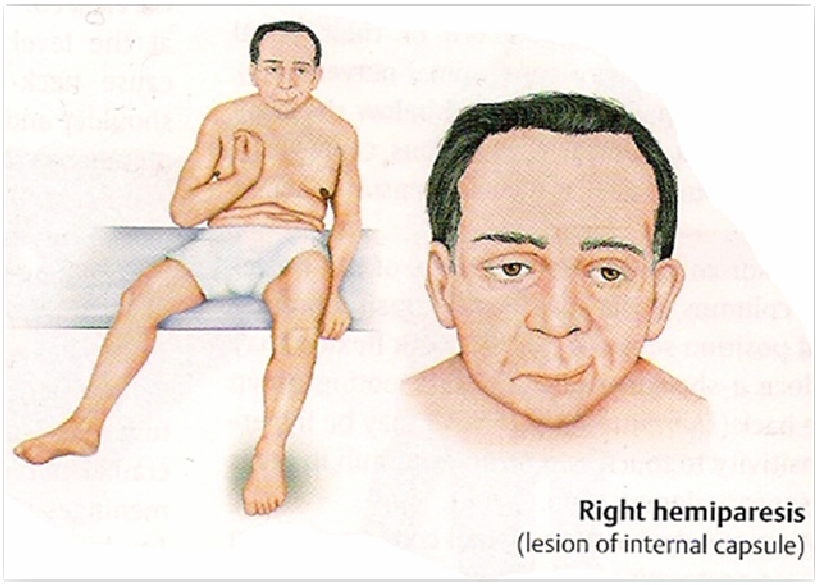

Fig 3, Right hemiparesis [4]

Unilateral lesions in the rostal brain stem cause contralateral spastic hemiparesis and ipsilateral nuclear oculomotor nerve palsy, called crossed paralysis. [4]

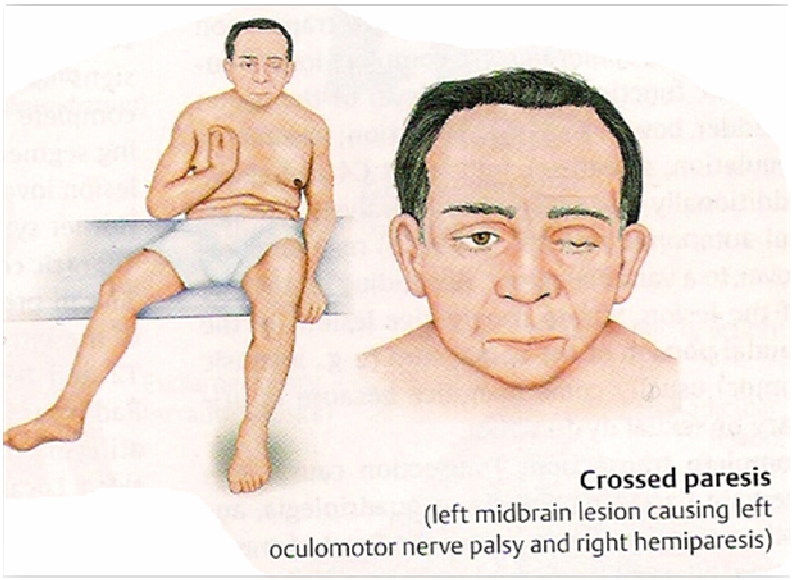

Fig 4, Crossed paresis I [4]

Ipsilateral paresis

Ipsilateral paresis is caused by lesion of the lower medulla below the pyramidal decussation. This type of lesion cause ipsilateral paralysis and spasticity. This type can be seen as a diagonal pattern where for example right upper extremity and left lower extremity is affected. [4]

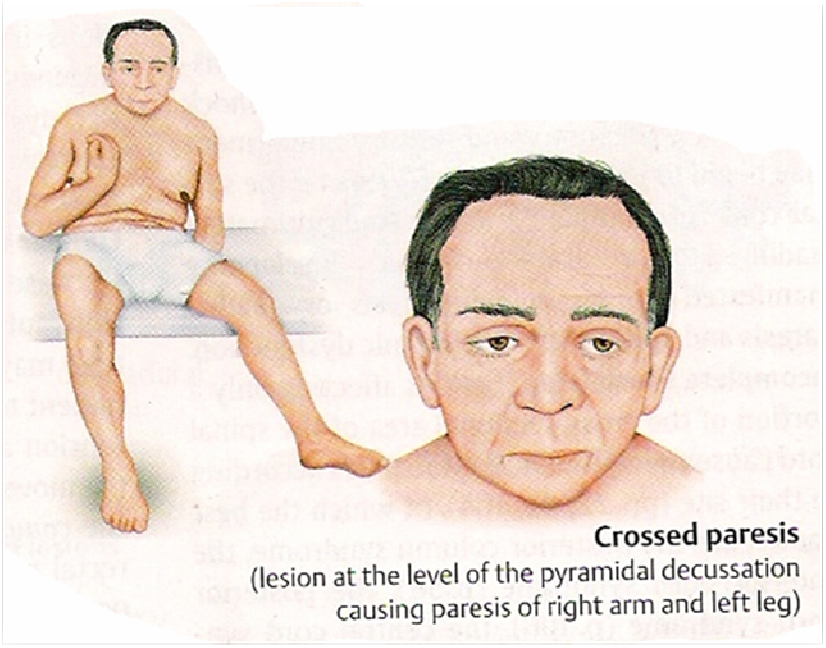

Fig 5, Crossed paresis II [4]

The most important cause of spastic hemiparesis is a vascular diseases in brain or brainstem as well as post traumatic lesion (brain contusion, epidural and subdural hematomas). Other causes can be brain tumor, brain abscess and multiple sclerosis.

3.5 Hemiparesis

Acute lesion of the direct and indirect supra nuclear pathways are firstly seen as paresis with hypo reflexes. But after days or weeks, the paresis becomes spastic with increased tonus and with hyperactive tendon reflexes. The later development of the spasticity is caused by the denervating hyper sensibility of the motor neurons.

Acute hemisphere lesion develops sudden spasticity. That is a good prognostic sign which manifest that parts of the lost functions can be recovered.

Upper part of face, the forehead, is intact since it is bicortically innervated, meanwhile the lower part is paralytic since it is innervated unilaterally.
The face paralysis usually affects the voluntary movements, not the emotional movements such as a spontaneous smile. In the extremities, the fine movements are more affected then the gross movements, as mentioned before the hand is the most effected part of the upper extremity. [3]

There is a specific pattern cause by the hemiparesis. In the arm, the shoulder abduction, elbow, wrist and finger extension as well as forearm supination and finger abduction are mostly affected. The affected person has therefore a tendency to hold the arm in adduction, flexion and pronation. In lower extremity, flexors and hip abductors mostly affected which causes the extremity to remain straight adducted. [3]

The specific patterns are a clinical advantage because the overbalances of the antigravity muscles make it able to stand and walk despite the weak muscles. The effected lower extremity also causes disturbance in walking. The abdominal and cremasteric reflex are hypo reflexive on the affected side. [3]

3.6 Therapy

Main therapy methods are:

- Soft tissue technique
- PIR technique
- Passive stretching of spastic muscles
- Mobilization of periphery
- Active exercises on hemiparetic side to maintain range of motion
- Strengthening of weak/spastic side (PNF)
- ADL routines training

Soft tissue technique: [8]
Soft tissue technique is used on cutaneous and subcutaneous tissue to stimulate and relax facia in restricted direction. Soft tissue technique is used before an exercise session and is good for a warm-up so the patient is relax rather than tensed.

Post isometric relaxation: [4]

PIR technique is used to relax muscle spasms and reduce muscle tension if there are trigger points present. Although PIR technique does not have long lasting effect on spastic muscles, but it is has a small effect which obtains myofacial release on hemiparetic side which can be useful to relax the patient before a strengthening exercise.
The PIR technique is performed by bringing the muscle into a position which attains its maximum length without stretching. In this position the patient is asked to give a small resistance with minimal force. The resistance is held for 10 s, and then the patient relax and the range of position is hopefully increased. To obtain maximal relaxation, the technique is combined with inhalation and exhalation. Inhalation stimulates the muscle while exhalation relaxes the muscle. It is also possible to use eye movements to achieve better results.

Passive stretching: [2]

Passive stretching is the most effective way to increase range of motion in joints of hemiparetic side. Since the joint, capsule, ligaments and muscles are stiff the extremity is usually kept in flexed, adducted and pronated position. Therefore pain might appear when therapist passively stretches the hemiparetic extremity.

Joint play and mobilization: [6]

Mobilization and manipulations is done to restore normal mobility mainly of joints, but also soft tissue which is attached to the bones. Since hemiparetic patients have decreased motion on spastic side, blockages and restrictions may develop. Therefore are joint play examination and therapy provided by fixating the proximal joint and distracting the two joints which being examined. Then you move the distal bone to the barrier of the direction you want to examine. If restriction or blocage is detected, mobilization is provided with spall repetitive movements in the same position. Traction and thrusting technique is also possible to provide.

Active exercises:

Patient should train active motion to increase the mobility and also inhibit muscle atrophy and weakness. Active exercises will help the patient maintain and improve balance and stability. If the patient strengthens the hemiparetic side and improves deep stabilisation of trunk and upper body, there will be abilities for an easier lifestyle.

Proprioceptive neuromuscular facilitation [6]

PNF technique is an approach to therapeutic exercise which is suitable for a wide range of diagnosis. The technique facilitates sensory receptors, which gives information concerning movement and position of the body, by muscle strengthening to achieve patient's highest level of function.

For a hemiparetic patient, PNF technique is suitable because the patient's extremity has to be kept in a specific position. The patient exercise strength as well as he will be improving range of motion of the hemiparetic extremity. PNF technique contains of movement of each extremity in different diagonals. We can differentiate between strengthening and relaxation techniques within PNF. As the patient moves, therapist gives specific position instructions which the patient has to follow. Therapist facilitates sensory receptors by giving light resistance to the part which is being improved.

Active daily living routines training: [7]

For a patient with hemiparesis, it is very important to train ADL routines. If the patient knows how the right way to provide a movement, there will be fewer chances to get harmed or develop a worse condition. Patient will also find it easier to maintain situations in daily life. Exercises by Professor Bobat are advantageous for hemiparetic patients.

Botulinum toxin:

Treatment with botulinum toxin may be used when there is spasticity and hypertonic muscles after hemiparesis. Since the half side of patient is spastic, it is possible to inject botulinum toxin into the muscles which are the hardest to maintain.

3.7 Facial palsy

The facial nerve is the seventh (VII) of the twelve paired cranial nerves. The facial nerve has both sensory fibres and motor fibres. The sensory part of the facial nerve arises from the nervous intermedius. Function of sensory fibers is: taste at the front 2/3 of the tongue and sensations at the outer ear are transmitted by the 7th nerve. [3]

The motor branch innervates facial muscles and it also contains some sympathetic motor fibers which constitute the vasodilator nerves of the sub maxillary and sublingual glands.

Facial nerve palsy is a nervous system disorder in which a damaged nerve in the skull affects the movement of the muscles of the face. It is a form of cranial mononeuropathy of the 7th cranial nerve. [(3)]

Disease organisms attacking tissues through which the facial nerve runs can disorder its function and anything that may cause swelling or pressure on the nerve can result abnormal function.

Some of the general causes of problems along the pathway of the facial nerve include:

- Congenital (birth) abnormalities
- Infections of the middle ear (otitis media or cholesteatoma)
- Infections or tumour of the parotid gland
- Complication after an operation in the ear area (for example, after mastoidectomy)
- Facial and neck trauma

The most common causes of facial nerve paralysis a viral infection called Bell's palsy [(3)], but in the case of my patient, there was a facial trauma because of the car accident.

3.8 Transversal spinal lesion

Paralyses may be of mixed upper and lower motor neuron type if the lesion affects not only the long fiber tracts but also the anterior horn cells of the spinal cord or their distal processes. Reflex abnormalities are found below the level of the lesion.

Spinal cord transaction causes acute spinal shock, a complete loss of autonomic function below the level of the lesion such as bladder, bowel and sexual function. Injuries at C4 and above cause respiratory paralysis.

Complete transaction causes immediate flaccid paraplegia or quadriplegia, anesthesia and areflexia below the level of transaction. The motor and sensory impairment may begin to improve within 6 weeks if the spinal cord is incompletely transected, ultimately leading to

a stable chronic myelopathy manifested by spastic paraparesis or quadriparesis and sensory and autonomic dysfunction.

Lesion around L1 causes flaccid paraplegia and bladder dysfunction. Iliopsoas weakness may make it difficult or impossible for the patient to sit. Lesions in this region will also cause impairment of hip extension and flexion, knee flexion and foot and toe movement. *(4)*

Typical signs for transversal spinal lesion are:

- Reflex abnormalities: the intrinsic muscle reflexes are diminished or absent
- Muscle tone: muscle atrophy due to LMN lesion
- Spontaneous movements: are seen in affected muscles. Fasciculations are involuntary, non-rhythmic contraction of motor units in a relaxed muscle. *(4)*

4. Methodology

A case study conducted on an adult woman, with hemiparesis at Facultni nemocnice Kralovské Vinohrady, in Prague, Czech Republic. Examination and therapy was applied to the patient 06.01.2010 to 15.01.2010, along with a final kinesiological examination.
Later, an additional visit was done on 21.01.2010 to finish remaining paperwork and get missing data from the doctor's documentation.
The patient came to physiotherapy twice a day in three weeks, along with ergotherapy once a week. Together we had 17 sessions in two weeks where each session started between 8 - 10 and 13-15. One therapy session took approximately 30 -45 min. On Fridays she only had one session a day.
General therapeutic approaches were used such as soft tissue technique, hot towel technique, PIR, PNF, mobilization, taping, stretching, reflexive locomotion training, ADL training, scar therapy, neurophysiologic exercises (Bobat, Kabat and Vojta) and breathing exercises.

An informed consent form was signed by the patient, in which her right to privacy was respected. This case study has been approved by the Ethics Committee of the Faculty of Physical Education and Sport at Charles University in Prague.

5. Special part

5.1 Patient information

Examined person D.K, female

Year of birth 1966

Diagnosis

S24.3 Post traumatic transversal spinal lesion in Th12
G82.2 Paraplegia of lower extremity and anesthesia from Th 12 and distally
S06.3 Contusion of left side of frontal lobe
G80.2 Hemiparesis of right upper extremity and right side of face
G51.0 Slight dysarthria of facial nerve VII
G95.8 Incontinency of urine and fecal
H47.4 Temporal hemianopsia, right eye

5.2 Present state

The patient arrived at FNKV 5th of January 2010 as an in-patient. She uses a wheelchair for transport due to transversal spinal lesion in Th12 and paraplegia of lower extremities. She is disturbed by sudden pain in her lower extremities, especially right lower extremity. She has a tendency to have edema and swelling of both feet around ankle region. She is able to work well with ADL routines, but her way of performance is not accurate. She is oriented by the place, time and her personality. Her main problems at the time is balance problems in upper body and trunk because of paraplegia of lower extremity, pain in left upper extremity, weakness and spasticity caused by hemiparesis in right upper extremity and weak facial expression on right side due to damage of facial nerve.

From medical documentation:

Height: 166 cm
Weight: 50 kg
BMI: 18.1
BP: 100/60
Pulse: 78/min

5.3 Anamnesis

Chief complaint: The patient has a tendency to not use her right spastic arm. She complains about pain in her left shoulder, elbow and wrist and about parasthesia in 1st- 3rd finger in left upper extremity.

History of present problem: The transversal spinal lesion occurred when she had a car accident in July 1997. She was operated in august of 1997 where they made a fixation of Th 12- L1. She was admitted at Centrum Paraple in Prague where she got regularly therapy. Since the accident, she has a routine where she gets regular therapy by Centrum Paraple, FNKV RHB and Kladruby. Now she came to FNKV 5th of January 2010.

Functional history: She uses a wheelchair for transport. She usually needs assistance when she goes to town/city etc. She is prohibited electrical chair because of bitemporal hemianopsia of right eye. Patient use her right hand while writing.

Psychosocial history: The patient lives alone in an apartment with no stairs.

Occupational history: Disabled for lifetime.

Surgical history: Cyst ovarian operation in 1986.

Medications: Sirdalud 2 mg tbl. 1-0-1, Oikamid cps. 1-1-0, TramalR 200 mg 0-0-1, Apo-Gab 300 3-2-3, Paralen 500 mg 3-2-3, Magne BC 0-1-0 and Biosil plus tbl. 2-0-0.

Allergy: N/A

Diet: N/A

Gynaecological history: menopause and galactorrhea. She gave birth to a child in 1993.

Family history: mother has Diabetes Mellitus type II.

Hobbies: at summertime she spends time at a garden near her house to socialise with fiends, but stays mostly inside at wintertime because of difficulties to travel.

Abuses: coffee 2 times per day.

5.4 Previous rehabilitation

She has a routine where she is admitted 2 weeks at Centrum Paraple: working with ADL exercises according to wheelchair use, 6 weeks in Kladruby: training ADL routines and carrying herself due to different circumstances and 3 weeks at FNKV RHB: Physiotherapy; stretching, strengthening, improving function of right arm, right side of face and releasing overload on left upper extremity, Ergotherapy; ADL routines and stretching of right arm and relaxation of face. Last time she visited FNKV was in December 2008 and has now been admitted as an in-patient (05.01.2010). She also receives ergotherapy on Fridays as well as physiotherapy 2 sessions a day at the rehabilitation department of FNKV.

5.5 Statement from the patient's medical documentation

Wednesday 06.07.2010: After the car crash they fixated Th 12-L1 08/97. Her right arm has hyper reflex of C5-C8. She has spasticity in all segments. No reflexes on legs. Decubitus on both feet ankle region: right: 2 x 3 cm, left: 1 x1 cm and anaesthesia in feet. She has psychological depression at times.

5.6 Initial kinesiological examination (07.01.10)

Observation: [7]

Patient cooperates well and understands orders given by the therapist. She talks slightly blurry but there is no problem understanding her.

Aspection: [7]

The patient is in sitting position in her wheelchair when aspection examination is done. Slight face asymmetry is present. When she talks, it is possible to notice that her right side of mouth drops slightly down comparing to her left side. Skin and lips colour looks normal. She has a few cm long scar on her mandible and a scar after tracheotomy slightly above jugular notch.

She enters the room in a wheelchair and uses both hands to spin the wheels. We can see noticeable asymmetry when comparing both arms while she spins the wheels. There is greater activity and movement of the whole left when we compare both arms. The fingers

of right hand are constantly flexed and adducted while the fingers on her left hand move freely after each spin.

She carries her right arm in adduction and flexion. The elbow is mostly flexed and forearm is kept close to the chest. Wrist is in palmar flexion and her fingers are in flexion and adduction. The 5th finger is freer then the others fingers on her right hand.

In sitting position, her stabilisation is good. She may need some help with stabilization when undressing in sitting position. When she loses balance, she mostly falls forward.

While supine lying she needs a pillow underneath her knees to keep the lower extremity supported from falling out of the bed.

She has a scar on her lumbar area from Th 10 and caudally.

Posture examination: [1]

Sitting in wheel chair:

	Result
Posterior view	Left side of pelvis is higher.
	Left shoulder higher.
	Shift of body to right side.
	Scapula alata right side
	ABD of right upper arm.
Lateral view: left	Head slightly in forward position.
	Slightly protracted shoulders.
Lateral view: right	Right shoulder is slightly flexed and in internal rotation
	Right elbow is semi flexed.
Anterior view	Internal rotation of hips
	Add of knees.
	External rotation in knees and feet.
	Whole upper body slightly rotated to left side.
	Head slightly rotated to left side.
	Right shoulder medially rotated.
	Slight radial deviation of right wrist.

	Fingers of right arm are flexed.
	2^{nd} -4^{th} finger is adducted, 5^{th} finger is in normal position.
	Right thumb flexed and adducted.
	Leaning more to right her right side.
	Left side of body is more erect.

Table 2, Postural examination in sitting position I [1]

Supine lying on bed:

Anterior View	**Result**
	External rotation in hip, knee, feet.
	Hyper lordosis in lumbar spine.
	Pelvis in ante-version.
	Slightly protracted shoulders.
	Right elbow is semi flexed.
	Right shoulder medially rotated.
	Fingers of right arm are flexed.
	2^{nd} -4^{th} finger is adducted.
	Right thumb flexed and adducted.

Table 3, Postural examination in supine lying position I [1]

Superficial sensation: [8] scale from 0-10

Superficial sensation of face:

	Left	**Right**
Superior labialis	10	10
Inferior labialis	10	10
Supra labialis	10	10
Sub labialis	10	10
Zygomatic arch	10	10
Buccal area	10	10
Mandibular angle	10	10

Table 4, Superficial sensation of face I [8]

Superficial sensation of upper extremity:

	Left	**Right**
Hand	10	10
Forearm	10	10
Upper arm	10	10
Chest	10	10
Abdomen epigastric (Th7-8)	10	10
Abdomen mesogastric (Th 9-10)	10	10
Abdomen hypogastric (Th 11-12)	5	5

Table 5, Superficial sensation of upper extremity I [8]

Superficial sensation of lower extremity:

	Left	**Right**
Foot	0	0
Calf	0	0
Knee	0	0
Hip	0	0

Table 6, Superficial sensation of lower extremity I [8]

Deep sensation of upper extremity: (scale from 1-5)

Position sense:

Patient closes her eyes and tries to guess the movement of her extremity, which is moved by the therapist.	**Left**	**Right**
Movement in fingers	5	3
Movement in wrist	5	4
Movement in elbow	5	5
Movement in shoulder	5	5

Table 7, Deep sensation of upper extremity I [8]

Scar examination: [8]

Face: The scar is around 2 cm long and is located below right side of lower lip on her mandible. The colour, temperature and shape around and on the scar are normal.

She also has a scar near her jugular notch after tracheotomy. The scar is normal.

Spine: The scar is from Th 10 – L4. Colour and temperature of scar are normal.

Tactile sensation of lumbar scar: scale from 0-10

Area	Left side	Right side
Upper part (Th10-Th12)	10	10
Middle part (Th12-L2)	8	5
Lower part (L2-L4)	0	5

Table 8, Tactile sensation of lumbar scar I [8]

Palpation of lumbar scar:

Area	Restriction to
Upper part of scar	Left side
Middle part of scar	Cranial, left and right side
Lower part of scar	Right side

Table 9, Palpation of lumbar scar I [8]

C-curve and S-curve of scar was normal.

Palpation: [7]

Temperature: is same on both arms, but fingertips on right hand is slightly colder then left hand.

Muscles: (Tonus scale from 0-5, where 0 hypotone, 3 is normal and 5 is overloaded)

Muscles on left side	Muscles on tone left side
Upper Trapezius	4
Pectoralis major	4
Sternocleidomastoid	4
Flexors of wrist	4
Extensors of wrist	4
Thenar eminence	4
Biceps	3
Triceps	3
Gluteus maximus	0
Quadriceps	0
Hamstrings	0

Hip adductors	0
Gastrocnemius	0
Soleus	0
Tibialis anterior	0
Rectus abdominis	4

Table 10, Muscle tone on left side of body [7]

(Tonus scale from 0-5, where 0 hypotone, 3 is normal and 5 is hypertonic)

Muscles on right side	**Muscle tone on right side**
Upper Trapezius	+ 5
Pectoralis major	+ 5
Sternocleidomastoid	4
Flexors of wrist	+ 5
Extensors of wrist	+ 5
Thenar eminence	3
Biceps	+ 5
Triceps	+ 5
Gluteus maximus	0
Quadriceps	0
Hamstrings	0
Hip adductors	0
Gastrocnemius	0
Soleus	0
Tibialis anterior	0
Rectus abdominis	4

Table 11, Palpation of muscles I. [7]

Active and passive range of motion: [7]

Supine lying on bed:

		Active		**Passive**	
		Left	**Right**	**Left**	**Right**
	F	180°	120°	180°	120°
	E	45°	35°	45°	40°

	ABD	180°	110°	180°	120°
	ADD	0°	0°	0°	0°
	IR	70°	70°	80°	80°
	ER	90°	15°	100°	70°
	Hor ABD	90°	70°	90°	90°
	Hor ADD	30°	30°	35°	30°
Elbow	*F*	145°	140°	145°	140°
	E (sup)	0°	60° missing	0°	35° missing
	E (pron)	0°	30° missing	0°	15° missing
Forearm	*Sup*	90°	20°	90°	30°
	Pron	90°	90°	95°	90°
Wrist	*DF*	80°	5°	80°	60°
	PF	70°	10°	75°	70°
	U dev	45°	45°	45°	45°
	R dev	20°	0°	20°	5°
-MCP	*ADD*	0°	0°	0°	0°
	ABD	20°	15° in middle position, 0° in DF of wrist	20°	15° in middle position, 0° in DF of wrist
	F	90°	85°	90°	80°
	E	20°	20°	25°	20°
-PIP	*F*	120° 2^{nd}-5^{th} digit	120° 2^{nd}-5^{th} digit	120° 2^{nd}-5^{th} digit	120° 2^{nd}-5^{th} digit
	E	0° 2^{nd}-5^{th} digit	0° 2^{nd}-5^{th} digit	0° 2^{nd}-5^{th} digit	0° 2^{nd}-5^{th} digit
-DIP	*F*	70°	60°	80°	70°
	E	0°	0°	0°	0°
Thumb	*Opp to all fingers*	Good	Good	Good	Good
-MCP	*ADD*	0°	0°	0°	0°
	ABD	40°	40°	40°	40°
	F	70°	70°	70°	70°

	E	50°	45°	50°	50°
-DIP	*F*	90°	90°	90°	90°
	E	0°	20° missing	0°	0°
Hip	*F*	-	-	125°	110°
	E	-	-	50° missing	50° missing
	ABD	-	-	50°	45°
	ADD	-	-	5°	5°
	ER	-	-	50°	50°
	IR	-	-	35°	35°
Knee	*F*	-	-	30° missing	30° missing
	E	-	-	130°	130°
Ankle	*DF*	-	-	40°	40°
	PF	-	-	5°	5°
Foot	*Iv*	-	-	30°	30°
	Ev	-	-	15°	15°

Table 12, Active and passive range of motion in supine lying position I. [7]

Sitting position in wheel chair:

		Active		**Passive**	
		Left	*Right*	*Left*	*Right*
Shoulder	*F*	180°	120°	180°	120°
	E	45°	30° with 90° F of elbow	45°	35°
	ABD	180°	80°	180°	80°
	ADD	0°	0°	0°	0°
	IR	70°	65°	80°	75°
	ER	90°	15°	100°	65°
	Hor ABD	90°	90°	90°	90°
	Hor ADD	30°	30°	35°	30°
Elbow	*F*	145°	140°	145°	140°
	E (sup)	0°	50° missing	0°	40° missing

	E (pron)	0°	30° missing	0°	15° missing
Forearm	*Sup*	90°	20°	90°	30°
	Pron	90°	90°	95°	90°
Wrist	*DF*	80°	5°	80°	60°
	PF	70°	10°	75°	70°
	Udev	45°	45°	45°	45°
	Rdev	20°	0°	20°	5°
-MCP	*ADD*	0°	0°	0°	0°
	ABD	20°	15° in mid position, 0° in DF of wrist	20°	15° in mid position, 0 in DF of wrist
	F	90°	85°	90°	80°
	E	20°	20°	25°	20°
-PIP	*F*	120° 2^{nd}-5^{th} digit	120° 2^{nd}-5^{th} digit	120° 2^{nd}-5^{th} digit	120° 2^{nd}-5^{th} digit
	E	0° 2^{nd}-5^{th} digit	0° 2^{nd}-5^{th} digit	0° 2^{nd}-5^{th} digit	0° 2^{nd}-5^{th} digit
-DIP	*F*	70°	60°	80°	70°
	E	0°	0°	0°	0°
Thumb	*Opp to all fingers*	Good	Good	Good	Good
-MCP	*ADD*	0°	0°	0°	0°
	ABD	40°	40°	40°	40°
	F	70°	70°	70°	70°
	E	50°	45°	50°	50°
DIP	*F*	90°	90°	90°	90°
	E	0°	20° missing	0°	0°

Table 13, Active and passive range of motion in sitting position I. [7]

Active and passive movement of cervical spine: [6]

	Active	Passive	Notes
F	45°	45°	-
Anteflexion C0/C1	Normal	Normal	-
Retroflexion C0/C1	Restricted	Restricted	Almost no movement is felt.
E	45°	45°	Have the tendency to extend more to the left side when doing actively.
LF (right side)	45°	45°	Feels a stretch in left trapezius when doing passively.
LF (left side)	45°	50°	-
Rotation (right side)	60°	65°	-
Rotation (left side)	60°	65°	-

Table 14, Active and passive range of motion of cervical spine I [6]

Examination of Joint play in cervical spine: [2]

	Blockage
C0/C1 Rotation left side	No blockage
C0/C1 Rotation right side	No blockage
C0/C1 Lateroflexion	No blockage
C0/C1 Anteflexion	No blockage
C0/C1 Retroflexion	Blockage
C1/2-C5/6 Anterior direction	No blockage
C1/2-C5/6 Posterior direction	Blockage in C5-C6
C1/2-C5/6 Lateral direction right side	No blockage
C1/2-C5/6 Lateral direction left side	Blockage in C4-C6
C1/2-C5/6 Rotation right side	No blockage
C1/2-C5/6 Rotation left side	Blockage in C4-C6

Table 15, Joint play examination in cervical spine I [2]

Examination of Thoracic spine: [2]

Aspection: Scapula alata of right shoulder blade, flat upper thoracic spine.

Palpation: Patient has no pain when palpating erector spinae and the interspinal ligaments.

Active movement: Flexion: she moves forward and more to the left side, flat curve of upper thoracic spine. Lumbar spine remains straight and flat because of the surgical fixation.
Extension: slightly limited, flat upper thoracic spine
Lateral flexion: limited lateral flexion to both sides.
Rotation: restriction is mainly in left rotation lower thoracic spine

Movement against isometric resistance: normal flexion and extension, but slightly less power when rotate and lateral flex to right side compared to the left side.

Passive movement in individual segments: Patient has restriction almost in all segments in lateral, extension and rotation. The segments is stiffer as lower we palpate the spine.

Muscle strength test according Kendall: [1] *scale from 0-5*

Upper extremity:

		Left	Right
Shoulder	*F*	5	- 3
	E	5	+ 3
	ABD	5	3
	ADD	5	+ 3
	Hor ABD	5	- 4
	Hor ADD	5	3
	IR	5	+ 4
	ER	5	4
Elbow	*F*	5	4
	E	5	- 4
Forearm	*Supination*	5	- 3
	Pronation	5	- 3
Wrist	*Dorsal F*	4	2
	Palmar F	5	3
	Ulnar Duction	5	3
	Radial Duction	5	3
Finger	*ADD*	5	3
	ABD	5	3
	F	5	3
	E	5	- 3

Thumb	*ABD*	5	2
	ADD	5	2
	Opposition	5	3
	F	5	2
	E	5	2
Trunk	*F*	3	

Table 16, Muscle strength test for upper extremity I [1]

Face:

Innervated muscles	**Muscle action – active**	**Left**	**Right**
Frontalis	Raise eyebrows and wrinkles forehead	5	5
Corrugator supercilii	Pulls eyebrow medially and downward	5	5
Procerus	Pulls medial eyebrow downward	5	5
Levator Anguli Oris	Pulls angle of mouth upward	5	5
Nasalis, Alar portion	Widens the nose	5	5
Depressor septi and transverse portion nasalis	Narrowing nose pulls nose downwards.	5	5
Risorius	Aids smile with lateral pull	5	2
Zygomaticus major	Elevates corners of mouth	5	3
Levator labii superioris	Raise upper lip	5	2
Depressor labii inferioris and platysma	Pulls lower lip down and outward	5	2
Mentalis	Pulls skin of chin upward	5	2
Depressor anguli oris	Pulls corner of mouth downward	5	3
Orbicularis oris	Whistling position of lips	5	3
Buccinator	Pulls corner of mouth backward and compresses cheek	5	3
Pterygoideus lateralis	Moves jaw sideways, both sides	5	3
Temporalis, masseter and pterygoideus medialis	Close jaw and bite firmly, show the teeth that are being clenched	5	4
Suprahyoid muscles	Depress lower jaw against resistance	5	4
Orbicularis oculi	Close one eyelid at a time	5	1

Rectus medialis oculi and rectus lateralis oculi	Moves eyeball in horizontal plane , left and right side	5	5
Levator Palpabrae superioris et al.	Moves eyeball in vertical plane, Up and down	5	5
Infrahyoid muscles	Depress hyoid bone	5	4

Table 17, Muscle strength test for face I [1]

Neurological reflex examination: [8] *Scale from 0-4*

Deep tendon reflexes	**Left**	**Right**
Brachioradialis (C6)	2	3
Triceps (C7)	2	3
Biceps (C5-C6)	2	3
Patellar (L2-L4)	0	0
Supra patellar	0	0
Achilles (L5-S1)	0	0

Table 18, Deep tendon reflexes I [8]

Superficial reflexes		**Left**	**Right**
Abdominal reflex	Epigastric	Slight contracture	Slight contracture
	Mesogastric	Slight contracture	Slight contracture
	Hypogastric	Not present	Not present

Table 19, Superficial reflexes I.

Abnormal reflexes	**Left**	**Right**
Babinski's sign	Negative	Negative
Chaddock's sign	Negative	Negative
Oppenheim's sign	Negative	Negative
Vitek's sign	Negative	Negative
Zukovsky- Kornylov	Negative	Negative
Rosselimo	Negative	Negative
Hoffmann's sign	Negative	Negative
Tromner's sign	Negative	Positive
Juster's sign	Negative	Negative
Mingazzini	Negative	Positive

Barrè	Negative	Negative
Rusisky	Patient can't provide supination and DF of wrist on right hand	

Table 20, Abnormal reflexes I [8]

Breathing: [27]

Her breathing pattern is hard to see. But by palpation it was possible to feel upper and lower thoracic breathing. To test if she was able to use different types of breathing, we stimulated upper thorax, lower thorax and abdomen with our hands. We also tested if she was able to combine a wave of all three breathing forms.

Observation of movement pattern: [7]

Patient prefers to shift from wheelchair to bed and from bed to wheelchair from her left side.

Movement pattern from wheelchair to bed from left side of her body:

When moving from wheelchair to bed she prefers to use her left side. She parks her wheelchair beside the bed, which needs to be in the same height at the wheelchair, and moves on the bed from the left side. She first places her lower extremities on the bed and then shifts her trunk in slow movements near the bed. When she is halfway on the bed, she grabs the opposite side of the bed with her left arm and drags herself over on it. She is constantly in flexion with her upper body because otherwise she will lose balance and will fall back. She did not use her right arm and hand to grab the bed or shift the lower extremity on the bed. She needs only a little assistance to not lose balance but otherwise she was able to perform it by herself.

Movement pattern from bed to wheelchair from left side of her body:

The bed is in same height as the wheelchair. She turns her back to the chair and corrects lower extremities. She shifts her trunk with the help of her both hands, left is in contact with the bed from palmar side while the right is made like a fist. When she is close enough to the seat, she lifts she trunk with the help of her hands (which are placed on the bed), and puts it down on the seat. She uses her left arm to take her lower extremities off the bed. She now corrects her position and legs.

Patient prefers to use only her left arm when dressing and undressing herself.

Movement pattern when dressing herself using left arm:

She holds up her t-shirt with the left arm and put it near her right arm and pulls the right arm through. She pulls the right side of the t-shirt with the left arm up to the shoulder level. Then she threads the left arm through the t-shirt and out from where the arm should be. Then she uses her left arm to pull the shirt over her head and drags it down with her left hand.

Movement pattern when undressing herself using left arm:

She lifts the t-shirt with left hand above the abdomen and bends the right hand. She then use left hand to undress the right arm. Then she pulls the t-shirt all the way over her head and just letting the t-shirt drop in her left hand.

5.7 Conclusion of initial kinesiological examination

The characteristics of hemiparesis were noticeable before any examination was done. The position of her right arm was shoulder flexion, adduction and internal rotation, elbow in semi-flexion, forearm in pronation, wrist and fingers in flexion and adduction. This is a typical position for a patient with hemiparesis.

Since she has paraplegia of lower extremity and anesthesia from Th 12 distally, there were no results when testing reflexes of lower extremity. There were hyper reflexes of deep tendon reflexes on upper extremity and only Tromner and Mingazzini's sign were positive from the abnormal reflexes.

She is also diagnosed for slight lesion in right facial nerve, cranial nerve VII. The doctor assumes she hit her face during the car accident and she also has a scar tissue present on her right side of mandible which makes the doctors assumption quite likely utterly. There is asymmetry on her face while talking and she also has slight dysarthria. During manual muscle testing of face, we could clearly confirm weakness of right side muscles around mouth. The result of manual muscle testing also shows weakness of muscle orbicularis oculi of right side which is also innervated by facial nerve VII. The patient was not able to blink her right eye while trying to keep her left eye open. She was able to perform it on the left eye. The sensation of face was normal.

During range of motion examination, we obviously found restricted mobility and range of motion in joints, and also muscle spasticity of right upper extremity, especially right arm. The most important highlights would be the big difference and asymmetry of right and left

shoulder F, ABD and ER, elbow E with supination of hand, forearm supination, Wrist DF, PF and radial deviation. The measurements of the movements mentioned above are clearly restricted on the right side compared to the left side.

The patient prefers to use her left arm and lets the right arm remain in same flexed and adducted position most of the time. Patient complains about pain in left fingers, wrist and shoulder and by palpation we noticed hypertension of left side muscles as upper trapezius, pectoralis major, SCM, Thenar eminence and flexors and extensors of the wrist. Since she overuses her left arm we tested some basic active daily living exercises such as dressing and undressing and changing position from wheelchair to bed and vice versa.

Postural examination was done both in sitting and in supine lying position to see how she manage to proceeds in these limited positions which she use every day. Range of motion was also tested in both sitting and supine laying position. The results show that the range which was measured in laying position is slightly higher than the range measured in sitting position. This clarify that she is relaxed in supine position.

Some active movements of thoracic and cervical spine were provided to see how her mobility and movement pattern was. Results show that she has a tendency to move more to the left side rather than staying in the midline. This is caused by weakness of right side of body. When looking at joint play examination results, we surely found restriction and blockage in vertebra segments C5-C6 in posterior and lateral direction to left side. As lower we go, the stiffer it gets when we examine joint play in patient's thoracic spine. The blockage of the thoracic spine is caused by the limited movement ability she has when she is usually in sitting position in her wheelchair. Joint play was not examined in lumbar spine because of the surgical fixation caudally from Th 11.

The patient has several diagnoses and because of limited time duration, I have chosen to concentrate on only one of them in my Bachelor Thesis. Since the patient is paraplegic from Th 12 and caudally, the main task is to improve movement pattern and technique of her upper extremity. The hemiparesis makes it even more important to treat and train her spastic side to reduce the load off her healthy side so she would be able to use the whole upper extremity equally and be able to maintain daily routines without pain and overstrain of upper body.

5.8 Rehabilitation plan

I concluded a short-term and a long-term rehabilitation plans based on initial kinesiological examination, medical doctor's recommendation and advisor's suggestions.

5.8.1 Short- term rehabilitation plan

The main goal is to reduce the pain. This is done by continuing the daily therapy mainly by stretching out spastic muscles in right upper extremity, providing joint play on periphery; mainly in fingers, carpals and wrist of right hand, mobilization of right scapula and soft tissue technique on facia and muscles around right shoulder and chest. It is also important to focus on left upper extremity because of her tendency to overload it. Joint play in periphery; fingers (especially 1-3 digit), carpals, wrist and elbow of left upper extremity. Hot towel technique by Professor Brügger on left SCM, left pectoralis upper fibers and extensors of the wrist combined with PIR on the same muscles to release muscle tension.

5.8.2 Long-term rehabilitation plan

The ultimate goal is to make her use the right arm as naturally and as often she uses her left harm. At the moment, she only uses her left arm and totally forgets about her right. Therefore she needs both guidance and repetition of ADL activities where she actively uses her right hand so it would initially be used as a part of her daily life. To make that happen, it is important to increase range of motion in whole right upper extremity to create symmetry of both arms. By stabilization of right scapula and passive stretching of right upper extremity we will make it easier for her to regain an upright sitting position in both wheelchair and in bed. By using her right arm as much as her left she will find it easier to move herself from the wheelchair to bed and vice versa, dressing and undressing herself, cooking, cleaning etc. It is important that she cooperates and start using her right arms as a homework too because the therapy at FNKV has only a duration twice a day in 3 weeks.

5.9 Indication of rehabilitation from medical doctor's documentation

- Kinesiology examination
- Mobilization of periphery (arms and lower body)
- Myofacial technique for whole spine
- Relaxation of hypertonic muscles and stretching of shortened muscles
- Relaxation of scar
- Neurophysiologic exercises (Bobat, Kabat, Vojta)
- Breathing exercises/ Respiratory physiotherapy
- Strengthening of arms
- Facilitation of paretic muscles (extension) and anti-spastic muscles (push away blade)
- Vojta reflexive locomotion

5.10 Rehabilitation with day to day therapy

Day to day therapy:

The patient arrived at FNKV 05.01.2010 and was saying for 3 weeks as an in-patient. We started the examinations and therapy the day after she arrived and she had 2-3 therapy sessions a day, except Fridays where she had only one session. My stay at FNKV was 2 weeks and I worked intensively with the patient in 8 days, with an additional visit on the 21.01.2010. The patient also had ergotherapy once a week in addition to physiotherapy while she was admitted.

The first week I had full assistance by the supervisor, the second week I worked more independently with the patient. When exercising reflexive locomotion according Professor Vojta, the supervisor was in charge of the sessions. It was a great opportunity to learn a new method and provide it on an actual patient which was suitable for this therapy method.

Date: 06.01.2010

Goal of today's therapy unit 1: To get complete information about the patient, generally observe how the patient interacts with her body according to the diagnosis and to find out which examinations should be done.

Procedure: We took the anamnesis and parts of the initial kinesiological examination included; observation, aspection and palpation of patient's hemiparetic right arm and the healthy left arm. We observed patient's body language and the ways she managed to use the wheelchair, movement from the wheelchair to the bed and opposite, take her t-shirt of and the way she managed to lie down in supine position.

Results: The anamnesis and observation of the patient is complete. After today's meeting with the patient, it is clearly necessary for her to have daily rehabilitation and to receive education to provide self-treatment for better progression. Also after looking at her way of providing movement patterns, she definitely needs some assistance and training to prevent overloading of her left arm and left side of her body.

Goal of today's therapy unit 2: During therapy unit 1 she was mostly side lying on her left side, which is now causing pain to her left shoulder. She mostly is sitting in her wheelchair during the day. Since she is repeating the same routines every day, she complains of pain in her upper back and chest. Goal for the therapy unit 2 for today will be treatment of her left shoulder and her thoracic spine.

Procedure: Patient is lying on her right side. Her right lower extremity is flexed 90° in hip and knee and for stabilization of trunk and lower extremity she has a pillow underneath her right knee. Her right arm constantly slides is adduction, therefore it is kept in flexed 90° in elbow and shoulder joint. This position helps her to keep elongation of whole spine. Her left lower extremity is straight, and so is her left arm.

We start with gentle examination of thoracic spine in this position. We found stiffness and blockage of upper thoracic spine (from th1-th6). Mobilization was provided in the same side lying position. By palpation of upper thoracic vertebras with one hand and shifting shoulder and sternum in dorsal direction with other hand, we provided small repetitive movements.

Using an unspecific method, because of patient's limitation of changing positions, we examined ribcage and spine by placing one hand on the spin and the other hand on the sternum. Patient is inhaling and exhaling consciously while the therapist feels the movement of ribs and spine. After a while, therapist follows the patient's movement and also contributes with small movements with her own hands to archive greater mobility of spine and ribs.

For treatment of each vertebra in whole thoracic spine, we stabilize one vertebra at the time with thumb of one hand followed by dorsal movement of sternum with forearm of other hand. Patient inhales, and when exhalation therapist moves sternum in caudal direction.

Soft tissue technique was provided on facia around deltoid part in medio-caudal direction and facia around upper pectoral part in medio-cranial direction around left shoulder.

Following technique is by Capova for shoulder traction in dorsal direction; patient is prone lying. Left lower extremity is abducted in hip and knee is flexed 90°. A pillow is placed under left side of her pelvis. Her left shoulder is abducted 90 ° and elbow is flexed 90°. Head is facing down. Therapist stands from patient's right side and stabilizes her body close to patients back. Therapist put her left forearm underneath patients left shoulder and places her right arm underneath her left hand and holds the right forearm with her left hand. Then therapist use her whole body and gently push patients left shoulder in dorsal direction keeping the position of hands the same as when she started. The therapist slowly moves back, and repeats the procedure.

Results:

Release of blockage in thoracic spine and greater mobility in ribcage when breathing.

By doing medio-caudal facia on left shoulder, we felt shortness and stretching in upper pectoralis and SCM on left side. Release of upper pectoralis was achieved.

Sudden pain in both legs occurred. Patient was in great pain.

Patient is satisfied with shoulder traction and feels that the joint is not as stiff as before the therapy.

Goal of today's therapy unit 3: Scar examination, sensation examination around scar, soft tissue technique on facia around left shoulder and stabilization training of the right arm and trunk.

Procedure: scar examination is provided in side lying position, which is more comfortable for the patient the prone laying. The scar starts in th10 and ends in L4. Scar therapy is done because of restriction in different directions in all parts of scar. In upper part of scar therapy was done to the left side, in middle part of scar it was to cranially, left and right direction and in lower part it was to the right side. The therapy was provided using both hands going to the barrier of restricted side and waiting for the release.

Patient was already lying on right side and the soft tissue technique was provided in the same position. Restriction in posterior part of left shoulder in caudal direction was found and therapy was made by going to the barrier and waiting for release.

When observing patient putting her t-shirt on, we noticed that she only used her left arm.
Patient is in sitting position on the edge of bed. Stabilizing herself with the right hand on the surface of the bed and the left hand first, reaching out in 90° flexion, then in 90° abduction.

We then trained "push-to-bed" training with the right hand where she had to let go of the usual fist position of the hand and try to do dorsal flexion of wrist, extension and abduction of fingers and push the palm to the bed as if she was going to stand up.

Patient sits on the edge of bed and therapist sits in front of the patient. Patient place both hands on therapists shoulders and therapist moves in circles in both left and right direction to train balance with the patient. Patient tries to move with the therapist.
At the end patient kept the position of hands on therapists shoulder and was told to try to lift the pelvis from the bed, first from the left side and then from the right side.

Results: Release was felt in upper and middle part of scar to the left side and there was no restriction left. Restriction to the right side of the middle and lower part of scar remained.

Slight release is felt in posterior part of left shoulder in caudal direction. But the release will not remain because of overuse of the left arm.
Position of hand is unusual and uncomfortable for the patient when training stabilization of right hand.

Patient is really afraid to let go of both hands from the bed because of weak stabilization of trunk which will make her loose balance and fall. When we trained balance training she was uncomfortable at the beginning, but liked the feeling after a while. She improved the circling movements and was more independent in the end.
When lifting the pelvis from left and right side, the performance on the left side was better than the right.

Date: 07.01.2010

Goal of today's therapy unit 1: Is to treat the right side of upper extremity by achieving release of muscle tension in clavicular part of pectoralis major. Traction of right shoulder, facia technique on abdomen, strengthening of transversus abdominis and stretching of hand in different directions and soft tissue technique on facia of wrist.

Procedure: Palpation of right pectoralis upper fibers shows hypertone and stiffness. Hot towel technique by Professor Brügger is provided to relax the muscle. Soft tissue technique on facia is done on clavicular part of pectoralis major muscle in caudal direction.

Patient is supine lying with flexion of right arm in 90°, elbow is relaxed in flexed position. Therapist stands on the treated side and clasps her hands close to the shoulder joint. Therapist stabilize patients arm with her body. Patient inhale and while exhaling, therapist do traction with fingers and increase horizontal adduction or arm. The same traction technique was provided on the left shoulder as well.

Soft tissue technique was provided on patient's abdomen in latero-lateral direction. On the lateral sides of abdomen, the soft tissue technique was provided in caudal direction.

Patient is supine and therapist stands behind patients head. Therapist places her hands on lower ribs and asks for breath in, while breathing out, therapist push the ribs in caudal and medial direction and ask the patient to hold this position of ribs for a while and breathe normal, and then relax.

We provided soft tissue technique on facia around right wrist on anterior surface in cranial direction.
Massage of fingers and around wrist and passive stretching of wrist in dorsi flexion.

Results: The result of hot-towel technique does not last for a long time. But it makes it easier to work around the area while the tension of the facia and muscle is less.

Since the muscles are very spastic on the right side, the traction without breathing in and out was impossible. We also tried to stretch the clavicular part of pectoralis, to make it easier to do the traction.

The left shoulder seems to be in a good condition after yesterday's therapy, but we still provided the same traction technique which was provided on the right shoulder.

The soft tissue technique on stomach was provided to release some tension in the area and this may also facilitate abdominal breathing for further strengthening exercise which was provided.

Strengthening exercise for transverses abdominis was a difficult exercise for the patient, but she managed to improve with each repetition.

Soft tissue technique and passive stretching of wrist was provided because she always has her wrist in flexion and fingers in adduction. The stretching was painful and the barrier was stiff.

Goal of today's therapy unit 2: To work on strengthening her right arm as well as stabilizing her right scapula.

Procedure: Patient lie in supine position and hold both hands in 90° flexion. Patient now holds therapists hands and press against them.

1st and 2nd diagonal flexion pattern of PNF technique was provided passively by the therapist. After several repetitions, patient tried to provide it actively without resistance from therapist.

Sudden pain starts in her legs. She describes it as unbearable pain in different places each time in her lower extremities. The area of the pain is big but she doesn't know how to exactly describe the pain sensation.

Stretching of her right fingers in extension, ulnar duction and training only fine movement of wrist and fingers going from supination of forearm and flexion and ADD of fingers to pronation of forearm and extension and ABD of fingers.

PNF 1st and 2nd diagonal flexion pattern is provided again.

Results: Patient felt small pain during stretching out against therapist's hands and had had constant semi-flexion of elbow.

Passive PNF went good, but patient had problems with active movements. She was not able to provide DF of fingers, had problems to keep DF of wrist, to provide pronation of the forearm, to keep ulnar duction and extension of fingers.

After stretching and rehearsing each movement in one joint at a time, we feel less stiffness in joint and muscles and it is easier to lead her hand after stretching in specific directions.

PNF provided again shows improvement.

Date: 08.01.2010

Goal of today's therapy unit 1: The patient only has 1 physiotherapy session on Fridays. Today I got the opportunity to follow the patient at her ergotherapy session. The goal is to loosen up facial tissue and therapy of the right hemiparetic hand.

Procedure: Patient is supine lying with knees flex and supported by pillow. The therapist starts to stimulate patient's forehead by soft circulatory movements, stimulation of face from nose and laterally to zygomatic bones and then from each side of the nasal bone going caudally to upper lip. Then she provides small circulatory movement from lower part of nose laterally to the ears. Then she slowly facilitates the supra labialis area starting in the middle and going laterally on both sides. She also massage the mandible each side with both of her thumbs. She also stimulates the area between the patient's eyebrows and continues over both eyebrows. Then she starts near the ears and drags her fingers cranially over the temporal area and through the patient's hair attachment on forehead. She then moves her finger to sub labialis area and massages in lateral direction on each side. When facilitating sternum, she use both of her thumbs on each side of the sternum and press on the attachment of the ribs moving caudally.

She starts moving the facia on her forearm working her way from the elbow and down to the wrist. On her way down she has facilitated both facias around supinators and pornators. She now massages the palmar side of the patient's hand starting from the wrist and going all the way to her fingertips. She also facilitates lateral side of all fingers.

Results: Patient is very satisfied after the ergotherapy session. She thinks that the facilitation of face and hand was very pleasant and relaxing.

Goal of today's therapy unit 2: Mobilization of fingers and wrist of right hand, relaxation of facia shoulder, upper trapezius and upper pectoralis muscle. Reflexive locomotion by Professor Vojta (reflexive turning to side).

Procedure: Patient is in a supine position with a pillow underneath her knees.
Mobilization is done on DIP, PIP, MCP, metacarpal heads (scissors dorsal and palmar fan), and mobilization of radio-carpal joint in dorsal and proximal row and mobilisation of carpal bones by shearing technique according to Professor Lewit.

Hot towel technique is provided on left upper trapezius.
PIR according to Professor Lewit is done on left clavicular part of pectoralis major.

A soft tissue technique is done on facia in dorso-caudal direction of left shoulder.

Sudden pain in lower extremity starts and we have to stop the therapy for a while.

Reflexive turning to the side is provided, but the patient has to be prone lying, which is very uncomfortable for the patient because of the ante-version of pelvis.
Therefore we place a chair on the right side of the bed. The bed has to be high enough so she can lie prone on the edge of the bed and place her right knee on the chair. The right knee must be in 90° flexion in hip and knee. The position eliminates the ante-version of pelvis and is more comfortable for the patient. Her left shoulder is in 90° ABD and left elbow is 90° flexed.
Her starting position is set, but she needs correction of: shoulder toward spine, head down and elongated elevation of shoulder done by therapist (to eliminate activation of trapezius and activate scapula muscles. Now patient press actively her forearm down to the table, lifts up her belly from the table and elongate her spine and try to keep head same as in staring position.

Results:

Mobilization of her left hand always gives here greater mobility of hand.

Hot towel on trapezius was relaxing and released some tension from the muscle.

PIR technique of pectoralis major was slightly painful and she felt great amount of stretching.

The reflexive turning to the side was done on the left side, which became easy for her. The concern might be how she will provide the same exercise on the hemiparetic right upper extremity.

Date: 11.01.2010

Goal of today's therapy unit 1: Observation and correction of patient's ADL routines

Procedure: Watching the patient enter the room in her wheelchair, shifting position from wheelchair to bed from the right side of her body, taking off her t-shirt mostly using her right hand, dressing herself using her right arm, changing position from bed to wheelchair from the right side of her body, observing when patient is writing and reaching for a bottle to drink.

Patient was corrected and fixation was made to her right shoulder and scapula, stomach and legs after the observations.

Results: The results of the observations are described in the initial and final kinesiological examination, except the practice of handwriting and reaching for a bottle to drink.

Patient writes with her right hand. She has problems holding the pen because of stiffness in fingers.

Patient rolls herself to the table using both hands. She puts the break on the wheelchair with her right hand. She leans her upper body forward to reach the bottle with her right hand. When she grasps the bottle, she does not include her little finger. She may need some help to fully grasp around bottle. Since her fingers are naturally is in flexed position, it is hard for her to extend them to get a nice grip around the bottle. When drinking from the bottle she leans backward in extension.

Right shoulder and scapula fixation: She does not lean too much into flexion with her upper body when picking up bottle. Patient used all fingers when picking up bottle. When

drinking, she remains stabilized in upright position and only does a small movement of the head into extension.

Stomach fixation: Patient leans forward, not so good handgrip around bottle and does rotation to the right side with upper body and great extension of cervical spine when drinking from bottle.

Leg fixation: Patient leans forward, has a good handgrip around the bottle and does not extend upper body while drinking.

Goal of today's therapy unit 2: Stretching and strengthening of muscles of right arm. Strengthening especially of scapula fixators.

Procedure: PNF technique 1st diagonal extension pattern with slow reversal technique.
The movement is first provided passively, actively and then against slight resistance.

We provided some active exercises where she could strengthen and improve fine movement of her right arm.

Push and pull movement:
Patient is sitting. Patient threads her right hand fingers into therapist's fingers. Therapist now pushes the patients arm in extension with bent elbow by holding her hand. Therapist pull the arm in flexion with elbow stretched passively.
Now patient does this push and pull movement actively, and then against resistance.

Exercises with towel:
Therapist holds a towel vertically in front of the patient. Patient has to pull the towel down with her right hand.
Then patient holds the towel with both hands horizontally in front of her. She holds the towel with her left hand and twists the towel with her right hand, both forward and backward.

Clasped hand exercise:
Patient is sitting. She clasps her hands and provide a diagonally pattern where she first goes from her left knee and up above her right shoulder and back down, and then from her right knee and up above her left shoulder and back.
She also provides horizontal side to side movement with clasped hands.

Results: Patient finds it hard to follow the instruction, but improves after several repetitions. The exercise is nice for her because she has to stretch out her arm, which is the opposite position she is used to for her right arm. The movement is not smooth because of the spasticity and it is necessary to wait for release.

Passive and active movements of the push and pull exercise went fine. But the pushing movement into flexion was better than the pulling movement which was into extension.
Pushing forward: grade 3+
Pulling backward: grade 3

Patient complained about slight pain in her right arm while doing the towel pull exercise. She found it hard to provide. When twisting the towel with her right hand, it was easier for her to twist the towel forward where her wrist does plantar flexion then twisting it backwards where she has to provide dorsal flexion of the wrist.

When patient did the exercise with clasped hands, her right hand had the tendency to just follow while the left arm did the movement, especially when she went from right knee to left shoulder. It was harder for her to go from left knee to right shoulder.

Goal of today's therapy unit 3: Relaxation of right arm and neck and some scar therapy.

Procedure: Patient is side lying on her left side. Her shoulder and scapula is fixated to achieve ultimate relaxation for her. She is told to brush her hand on the therapist's knee. Then she is told to tap her fingers on the therapist's knee, and in the end she is told to go from flexion to extension with her fingers by using therapist's knee as a support.

Traction with PIR according Professor Lewit was done on the right shoulder. Patient was supine and had 45° ABD in right shoulder.
Traction of cervical spine was provided according to Professor Lewit. Patient is supine lying.

The therapist used taping method to get optimal relaxation of the right shoulder by relaxing facia and the trapezius muscle. The taping was done from over the scapula and going to the anterior side of body.

At the end, scar therapy was applied on her face beside her lower lip on right side.

Results: The exercise with fixation of her shoulder and scapula was done to relax the right arm and fingers so she could successfully provide extension of the fingers.
When providing traction, patient feels stretching in biceps and trapezius of right side.
Patient felt comfort and release after taping her scapula and shoulder region.
The scar on her face was in normal condition.

Date: 12.01.2010

Goal of today's therapy unit 1: Stretching and relaxation of left hand and arm and stabilization exercise for right scapula

Procedure: Hot towel technique on left palm. Patient complains over a different feeling in 3^{rd}- 5^{th} finger.
Passive stretching into ER in shoulder, supination of forearm, E and ABD of fingers and thumb, DF of wrist.
Palmar fan was provided on her left hand.
Stretching of inter digitital facia and mobilization of carpal bones against each other, mobilisation of DIP and PIP joint with unspecific method.
Soft tissue technique on thenar and hypo thenar of left hand.

This exercise is named Reflexive turning by Professor Vojta. Since patient is not able to provide full turning yet, we will be exercising parts of the exercise to stabilize muscles and rehearse the movements. Patient is prone lying. Her right shoulder is in 90° ABD and elbow is flexed 90° with wrist in DF. Her hip is ABD 45° with a pillow underneath the hip joint and the knee is flexed.
To keep a good position of her right shoulder, the therapist stabilizes the patient's shoulder with her arms. Patient is told to correct her head position into a neutral position, spine is straight. Firstly, patient press her right forearm to the bed, then activate abdominal muscles and slightly lift her stomach from the bed, then stabilize shoulder and scapula and keep the dorsal flexion in right wrist.

Results: Patient is very satisfied over the taping from yesterday on her right shoulder.
Although passive stretching is slightly painful for the patient, it always helps her to improve her range of right arm for a period of time. Relaxation of left hand and arm was successful.

When doing stabilization exercise of right scapula, patient had problem focusing because of the all the positions she had to keep. The position of the neck and shoulder was also limited because of stiffness in pectoralis and SCM. She also had problems keeping the DF of right wrist and keep straight head position. After several repetitions, there was improvement and activation of scapula muscles.

Goal of today's therapy unit 2: Aspection of face and therapy. Relaxation of right pectoralis major.

Procedure: Patient's face and neck was palpated and scar examination was done. A fold was made on the scar. Facilitation method by Sister Kenny was provided on risorius and zygomaticus.
Hot towel technique by Brügger was done on patient's right pectoralis major. Passive stretching was done with fixated sternum.

Results: When palpating face, bigger tension was felt in right chin, which may be because of the scar. The scars were in normal condition both on chin and also the scar on jugular notch. When palpating masseter muscle, stiffness was felt on both sides of face. When testing facial expressions, we could see that risorius and zygomaticus were weak on right side. 25% of the active movement was missing. Facilitation of risorius and zygomaticus showed no improvement. The buccinators muscle was normal on both sides.

When passive stretching of right pectoralis major, patient's elbow was is semi flexion and forearm in pronation. The barrier was hard to begin with, but slight release was obtained after a while.
We had to stop the therapy session because of sudden pain in her lower extremity.

Date: 13.01.2010

Goal of today's therapy unit 1: Relaxation of right trapezius, latissimus dorsi and rhomboids. Mobilization of right scapula, reflexive turning exercise to practice correct movement from lying to sitting position.

Procedure: Hot towel technique on right upper trapezius, latissimus dorsi and rhomboids.
Modified mobilization of right scapula to lateral side in side lying position.

Reflexive turning exercise by Professor Vojta: patient is side lying on left side. Shoulder and elbow is in 90° flexion. Head is not touching bed, elongated and patient looks down. Patient is now going from laying to sitting in oblique position. Firstly, patient move the elbow from flexion to extension and forearm in pronation. Wrist should be in ulnar duction. Patient press her forearm to the bed and activate abdominal muscles. She now lifts her left side of body up from the bed while she has her right arm in front of her body and right palm is on the bed in DF. She now uses both hands and abdominal muscles to push her upper body up into sitting position.

Results: Hot towel technique and mobilization of scapula was done to relax spastic muscles and to improve further exercise.
Patient successfully provided reflexive turning exercise with few mistakes. Her right shoulder has the tendency to do ADD, therefore the shoulder was stabilized by the therapist from the posterior side. She also needed some stabilization of her pelvis and to move her lower extremity from laying on the bed to hanging drown from bed when she was in sitting position.

Goal of today's therapy unit 2:

Procedure: The therapy is done in sitting position. Modified PNF technique is done actively by the patient. Patient does both 1st and 2nd diagonal flexion and extension pattern. Each diagonal is done simultaneously with both hands.

A medicine ball is placed between her knee to eliminate ADD and external rotation of hips.

Exercises by Professor Bobat are provided in sitting position. Patient clasp her hands and lift them in 90 ° F of shoulders.
Patient clasp her hands and elbows are extended. Patient lift her hands over her both shoulder in a diagonal movement.

Patient is told to use her right hand to drink from a bottle.
She is told to roll the bottle under her forearm and fingers.
She has to pick up ha bottle which is lying horizontally on the table. The task is to make it stand vertically without falling.
She uses a keychain around her neck. She is told to unclip the key from the keychain and clip it back on again using both hands.

Exercise to use right hand when opening a bottle cork and closing it.
She also rehearsed how to open the cork while the bottle was lying horizontally.

Stabilization exercise is done where the patient is sitting and she moves her upper body in circles and side to side without using her hands for support.

Results: When patient was providing the Professor Bobat exercises with extended arms and clasped hands, she provided the diagonal nicely to the right side, but since the right arm is weaker the movement above the left shoulder was less than the other side.
When drinking form bottle she leans slightly backwards, hyperextend her neck and elevates her right shoulder.
She struggled a bit with unplugging the key chain, but managed it at the end.
Opening and closing of the bottle cork went smoothly.

During balance training patient had constant elevation of left shoulder, she was afraid she was going to fall forward. We tried to stabilize her pelvis without any success. We also tried to stabilize lower ribs which slightly helped her relax.

Date: 14.01.2010

Goal of today's therapy unit 1: Practice how to dress and undress with activity of right hand. Relaxation of neck and strengthening of scapula muscles.

Procedure: Procedure is described in final kinesiological examination.
A quick test was done by therapist, standing behind patients head while patient was supine lying on bed. Therapist push patients both shoulders downward to feel the barrier.
Traction of cervical spine was provided and PIR therapy on left SCM was done according to Lewit. Soft tissue technique was also provided on facial on left side of neck.

A quick modified mobilisation was done on patient's right scapula. The mobilisation was done side lying on left side. Patients shoulder was relaxed. The therapist is standing in front of patient and holds her lower angle of scapula and stabilizes patient's shoulder with the other. The mobilization is done in lateral direction.
Active stabilization and strengthening of scapula muscles is done with the patient side lying. Wrist is in DF and shoulder is ABD and elbow flexed in 90°. Patient keeps her head

in neutral position, DF of wrist and shoulders down and also presses the forearm to the bed. This exercise is a part of the exercise named reflexive turning by Professor Vojta.

Results: Patient was able to dress and undress nicely when using right hand.
When doing the quick test on the shoulders, therapist noticed that the right shoulder was easier to push then the left shoulder. Traction of cervical spine was pleasant for the patient and release of the SCM on left side was obtained after PIR and facia technique.

The mobilization of right scapula would help further exercise. When doing stabilization exercise, patient felt activity medially to scapula.

Goal of today's therapy unit 2: Train rhythm and strength of right upper extremity.

Procedure: We started the therapy session with a quick observation of how the patient used her arm, hand and fingers to roll the wheelchair forward.

Patient is sitting with a gym ball placed between both hands. Patient rolls the ball from side to side using her upper body hand arms.

Therapist sits in front of patient and rolls the gym ball to the patient and the patient rolls the ball back to the therapist. The exercise is repeated and patient is told to use only the right hand to roll back the ball.

When training a push away movement, patient push the ball dynamically with her right hand to the surface of a gym ball.

Patient and therapist also played a game where both of them roll the ball gently between their hands. Therapist and patient sit opposite to each other with the ball between them. Both hold the ball with one hand and rolling it with a slight force. One of them will suddenly give more pressure to the ball tilts to the opposite side, and the other person has to react quickly to stop the ball from falling by pushing back.

In this new exercise, patient has the ball close to her chest with her head relaxing on it. Her both hands will make a circle on the ball simultaneously. Firstly she will start going up and to the front completing the circle. And then going down and forward and complete the circle.

The ball is in front of the patient and the patient hit the ball with right hand whit slight power.
The gym ball has some texture on the surface. And patient is told to use index finger of right hand to follow the texture and try to make a fine movement with whole arm and wrist.

Patient claps her hands and moves the hands simultaneously up, down, to both sides and diagonally.

Patient holds a soft medicine ball with one hand at the top and one hand at the bottom of the ball. Her both elbows face to the sides. Patient now roll the ball in both directions.

Patient put her right hand on the surface of the medicine ball. She now use PIP and DIP to press her fingers down.

At the end, patient put the medicine ball on the bed and places the forearm on top of the ball mow she roll her forearm forward and backward over the ball.

Sudden pain occurred in patient's lower extremity, and patient has a tendency to contract both right and left upper extremity.

Results: The result of the quick observation is described in initial kinesiological examination.

Right side is stiffer during all for these exercises. And when she is told to use both hands, she is using her right arm less than her left. Patient also has the tendency to lean toward the right side when she is concentrating on a movement. Patient has difficult to do pushing away movement and complains of slight pain in shoulder and wrist.
When patient did the exercise when she had a big gym ball close to her body while doing circles on the ball with both hands, she had some dead points of the movement. When doing the circle going up and then down the dead point was on the peek to when she went down.
When going down and forward the dead point was on the peek to when she went up.
When patient was rolling the ball between her forearms the movement was rigid.

Date: 15.01.2010

Goal of today's therapy unit 1: Relaxation of right upper extremity and releasing of pain in left index finger. Mobilization and strengthening of right scapula.

Procedure: Hot towel technique is provided on wrist extensors of right arm and soft tissue technique on right upper pectoral part is done.
Then passive stretching of in extension is provided as well as passive stretching of pectoralis major.

Mobilization of the mid-carpal joint, mobilization by sharing and mobilization of radio carpal joint is provided according to Professor Lewit. Mobilization of all fingers joints (PIP, DIP, and MCP joint) is done in rotation, lateral, dorsal and ventral direction. All mobilization is done on right hand.

Patient complains about pain in left index finger, so mobilization of left index finger is provided in all joints and directions.

Mobilization of scapula is done in side lying position according to Professor Lewit.

Reflexive turning is done according to Professor Vojta to stabilize and strengthen right scapula. The focus is on activation of scapula and abdominal muscles.

Results: Some release after hot towel technique on facia of wrist and bigger movement achieved after passive stretching of pectoralis major right side.
The pain in index finger disappeared after mobilization.
When providing reflexive turning, patient has improved. But she still has the tendency to go from DF to PF of wrist. Since she is use to have her hand in a fist she has the tendency to make a fist while we are exercising reflexive turning.

5.11 Final kinesiological examination (21.01.2010)

Observation: [7]

Patient cooperates well and understands orders given by the therapist. She still talks slightly blurry.

Aspection: [7]

Examination is done in sitting position. The face asymmetry is still present in addition to slight dysarthria. Her skin and lips has normal colour.

Patient now use a medicine ball between her knees to correct external rotation in knees.

Patient still has the same position of her right arm, but she has greater wrist movement when she spins the right wheel. Her fingers are still adducted and flexed and elbow is semi-flexed. Patient tries to make an effort where she tries to activate her right arm.

Patients can undress and dress all by herself without any help and stabilization by the therapist. But we are ready to catch her in case she loses balance and fall.

Posture examination: [1]

Sitting in wheel chair:

	Result
Posterior view	Right scapula is abducted.
	Left side of pelvis is slightly higher.
	Left shoulder higher.
	Slight shift of body to right side.
	Scapula alata right side.
	Abd of right upper arm.
Lateral view: left	Head slightly in forward position.
	Slightly protracted shoulders.
Lateral view: right	Right shoulder is slightly flexed and in internal rotation
	Right elbow is semi flexed.
Anterior view	Internal rotation of hips
	Add of knees.

	External rotation in knees and feet.
	Whole upper body slightly rotated to left side.
	Head slightly rotated to left side.
	Right shoulder medially rotated.
	Slight radial deviation of right wrist.
	Fingers of right arm are flexed.
	2^{nd} -4^{th} finger is adducted, 5^{th} finger is in normal position.
	Right thumb flexed and adducted.
	Leaning more to right her right side.
	Left side of body is more erect.

Table 21, Postural examination in sitting position II [1]

Supine lying on bed:

	Result
Anterior View	External rotation in hip, knee, feet.
	Hyper lordosis in lumbar spine.
	Pelvis in ante-version.
	Right elbow is semi flexed.
	Right shoulder medially rotated.
	Fingers of right arm are flexed.
	2^{nd} -4^{th} finger is adducted.
	Right thumb flexed and adducted.

Table 22, Postural examination in supine lying position II [1]

Superficial sensation: [8] scale from 0-10

Superficial sensation of face:

	Left	**Right**
Superior labialis	10	10
Inferior labialis	10	10
Supra labialis	10	10
Sub labialis	10	10
Zygomatic arch	10	10
Buccal area	10	10
Mandibular angle	10	10

Table 23, Sensation of face II [8]

Superficial sensation of upper extremity:

	Left	Right
Hand	10	10
Forearm	10	10
Upper arm	10	10
Chest	10	10
Abdomen epigastric (Th7-8)	10	10
Abdomen mesogastric (Th 9-10)	10	10
Abdomen hypogastric (Th 11-12)	5	5

Table 24, Superficial sensation of upper extremity II [8]

Superficial sensation of lower extremity:

	Left	Right
Foot	0	0
Calf	0	0
Knee	0	0
Hip	0	0

Table 25, Sensation of lower extremity II [8]

Deep sensation of upper extremity: (scale from 1-5)

Position sense:

Patient closes her eyes and tries to guess the movement of her extremity, which is moved by the therapist.	Left	Right
Movement in fingers	5	4
Movement in wrist	5	4
Movement in elbow	5	5
Movement in shoulder	5	5

Table 26, Deep sensation of upper extremity I [8]

Scar examination: [8]

Face: The colour, temperature and shape of scar located on right side of mandible are normal. The scar after tracheotomy on her jugular notch also looks normal

Spine: Colour, temperature and shape of scar are normal.

Tactile sensation of scar: scale from 0-10

Area	Left side	Right side
Upper part (Th10-Th12)	10	10
Middle part (Th12-L2)	8	7
Lower part (L2-L4)	0	4

Table 27, Tactile sensation of lumbar scar II [8]

Palpation of lumbar scar:

Area	Restricted to
Upper part of scar	No restriction
Middle part of scar	Cranial and right side
Lower part of scar	Right side

Table 28, Palpation of lumbar scar II [8]

C-curve and S-curve of scar was normal.

Palpation: [7]

Temperature: is same on both arms and hands.

Muscles: (Tonus scale from 0-5, where 0 hypotone, 3 is normal and 5 is overloaded)

Muscles on left side	Muscles on tone left side
Upper Trapezius	4
Pectoralis major	4
Sternocleidomastoid	3
Flexors of wrist	3
Extensors of wrist	3
Thenar eminence	3
Biceps	3
Triceps	3
Gluteus maximus	0
Quadriceps	0
Hamstrings	0
Hip adductors	0
Gastrocnemius	0

Soleus	0
Tibialis anterior	0
Rectus abdominis	4

Table 29, Muscle tone on left side of body II [7]

(Tonus scale from 0-5, where 0 hypotone, 3 is normal and 5 is hypertonic)

Muscles on right side	**Muscle tone on right side**
Upper Trapezius	5
Pectoralis major	5
Sternocleidomastoid	4
Flexors of wrist	5
Extensors of wrist	5
Thenar eminence	3
Biceps	5
Triceps	5
Gluteus maximus	0
Quadriceps	0
Hamstrings	0
Hip adductors	0
Gastrocnemius	0
Soleus	0
Tibialis anterior	0
Rectus abdominis	4

Table 30, Muscle tone on right side of body II [7]

<u>Active and passive range of motion:</u> [7]

Supine lying on bed:

		Active		**Passive**	
		Left	***Right***	***Left***	***Right***
	F	180°	130°	180°	135°
	E	45°	35°	45°	40°
	ABD	180°	110°	180°	120°
	ADD	0°	0°	0°	0°

	IR	70°	70°	80°	80°
	ER	90°	30°	100°	65°
	Hor ABD	90°	85°	90°	90°
	Hor ADD	30°	30°	35°	30°
Elbow	*F*	145°	140°	145°	140°
	E (sup)	0°	40° missing	0°	30° missing
	E (pro)	0°	25° missing	0°	15° missing
Forearm	*Sup*	90°	30°	90°	30°
	Pron	90°	90°	95°	90°
Wrist	*DF*	80°	10°	80°	60°
	PF	70°	10°	75°	70°
	UDev	45°	45°	45°	45°
	RDev	20°	0°	20°	5°
-MCP	*ADD*	0°	0°	0°	0°
	ABD	20°	15° in middle position, 0° in DF of wrist	20°	15° in middle position, 0° in DF of wrist
	F	90°	85°	90°	80°
	E	20°	20°	25°	20°
-PIP	*F*	120° 2^{nd}-5^{th} digit	120° 2^{nd}-5^{th} digit	120° 2^{nd}-5^{th} digit	120° 2^{nd}-5^{th} digit
	E	0° 2^{nd}-5^{th} digit	0° 2^{nd}-5^{th} digit	0° 2^{nd}-5^{th} digit	0° 2^{nd}-5^{th} digit
-DIP	*F*	70°	60°	80°	70°
	E	0°	0°	0°	0°
Thumb	*Opp to all fingers*	Good	Good	Good	Good
-MCP	*ADD*	0°	0°	0°	0°
	ABD	40°	40°	40°	40°
	F	70°	70°	70°	70°
	E	50°	45°	50°	50°
-DIP	*F*	90°	90°	90°	90°

	E	0°	20° missing	0°	0°
Hip	*F*	-	-	125°	110°
	E	-	-	50° missing	50° missing
	ABD	-	-	50°	45°
	ADD	-	-	5°	5°
	ER	-	-	50°	50°
	IR	-	-	35°	35°
Knee	*F*	-	-	30° missing	30° missing
	E	-	-	130°	130°
Ankle	*DF*	-	-	40°	40°
	PF	-	-	5°	5°
Foot	*Iv*	-	-	30°	30°
	Ev	-	-	15°	15°

Table 31, Active and passive range of motion in supine lying position II [7]

Sitting position in wheel chair:

		Active		**Passive**	
		Left	***Right***	***Left***	***Right***
Shoulder	*F*	180°	130°	180°	130°
	E	45°	30° with 90° F of elbow	45°	40°
	ABD	180°	110°	180°	85°
	ADD	0°	0°	0°	0°
	IR	70°	65°	80°	75°
	ER	90°	30°	100°	65°
	Hor ABD	90°	90°	90°	90°
	Hor ADD	30°	30°	35°	30°
Elbow	*F*	145°	140°	145°	145°
	E (sup)	0°	40° missing	0°	30° missing
	E (pron)	0°	25° missing	0°	10° missing
Forearm	*Sup*	90°	30°	90°	35°
	Pron	90°	90°	95°	90°
Wrist	*DF*	80°	10°	80°	60°

	PF	70°	10°	75°	70°
	UDev	45°	45°	45°	45°
	RDev	20°	0°	20°	5°
-MCP	*ADD*	0°	0°	0°	0°
	ABD	20°	15° in mid position, 0° in DF of wrist	20°	15° in mid position, 0 in DF of wrist
	F	90°	85°	90°	80°
	E	20°	20°	25°	20°
-PIP	*F*	120° 2^{nd}-5^{th} digit	120° 2^{nd}-5^{th} digit	120° 2^{nd}-5^{th} digit	120° 2^{nd}-5^{th} digit
	E	0° 2^{nd}-5^{th} digit	0° 2^{nd}-5^{th} digit	0° 2^{nd}-5^{th} digit	0° 2^{nd}-5^{th} digit
-DIP	*F*	70°	60°	80°	70°
	E	0°	0°	0°	0°
Thumb	*Opp to all fingers*	Good	Good	Good	Good
-MCP	*ADD*	0°	0°	0°	0°
	ABD	40°	40°	40°	40°
	F	70°	70°	70°	70°
	E	50°	45°	50°	50°
-DIP	*F*	90°	90°	90°	90°
	E	0°	20° missing	0°	0°

Table 32, Active and passive range of motion in sitting position II [7]

Active and passive movement of cervical spine: [7]

	Active	**Passive**	**Notes**
F	45°	45°	-
Anteflexion C0/C1	Normal	Normal	-
Retroflexion C0/C1	Restricted	Restricted	Almost no movement is felt.
E	45°	45°	Have the tendency to extend more to the left side when doing actively

LF (right side)	45°	45°	Feels a stretch in left trapezius when doing passively.
LF (left side)	45°	50°	-
Rotation (right side)	60°	65°	-
Rotation (left side)	60°	65°	-

Table 33, Active and passive range of motion of cervical spine II [6]

Examination of Joint play in cervical spine: [2]

	Blocage
C0/C1 Rotation left side	No blockage
C0/C1 Rotation right side	No blockage
C0/C1 Lateroflexion	No blockage
C0/C1 Anteflexion	No blockage
C0/C1 Retroflexion	Blockage
C1/2-C5/6 Anterior direction	No blockage
C1/2-C5/6 Posterior direction	Blockage in C5-C6
C1/2-C5/6 Lateral direction right side	No blockage
C1/2-C5/6 Lateral direction left side	Blockage in C6
C1/2-C5/6 Rotation right side	No blockage
C1/2-C5/6 Rotation left side	Blockage in C5-C6

Table 34, Joint play examination in cervical spine II [2]

Examination of Thoracic spine: [2]

Aspection: Scapula alata of right shoulder blade, flat upper thoracic spine.

Palpation: Patient has no pain when palpating erector spinae and the interspinal ligaments.

Active movement: Flexion: patient moves forward and more to the left side, upper thoracic spinal curve is flat. Lumbar spine remains straight and flat because of the surgical fixation.
Extension: slightly limited, flat upper thoracic spine
Lateral flexion: limited lateral flexion to both sides.
Rotation: restriction is mainly in left rotation lower thoracic spine

Movement against isometric resistance: normal flexion and extension, but slightly less power when she does lateral flexion to right side.

Passive movement in individual segments: Patient has restriction almost in all segments in lateral flexion to each sides, extension and rotation. The segments is stiffer as lower we palpate the spine.

Muscle strength test according Kendall: [1] *scale from 0-5*

Upper extremity:

		Left	Right
Shoulder	*F*	5	3
	E	5	4
	ABD	5	+ 3
	ADD	5	3
	Hor ABD	5	4
	Hor ADD	5	3
	IR	5	4
	ER	5	4
Elbow	*F*	5	+ 4
	E	5	4
Forearm	*Supination*	5	3
	Pronation	5	3
Wrist	*Dorsal F*	4	+ 2
	Palmar F	5	3
	Ulnar Duction	5	+ 3
	Radial Duction	5	3
Finger	*ADD*	5	+ 3
	ABD	5	+ 3
	F	5	3
	E	5	3
Thumb	*ABD*	5	+ 2
	ADD	5	+ 2
	Opposition	5	3
	F	5	+ 2
	E	5	+ 2
Trunk	*F*	3	

Table 35, Muscle strength test for upper extremity II [1]

Face:

Innervated muscles	Muscle action – active	Left	Right
Frontalis	Raise eyebrows and wrinkles forehead	5	5
Corrugator supercilii	Pulls eyebrow medially and downward	5	5
Procerus	Pulls medial eyebrow downward	5	5
Levator Anguli Oris	Pulls angle of mouth upward	5	5
Nasalis, Alar portion	Widens the nose	5	5
Depressor septi and transverse portion nasalis	Narrowing nose pulls nose downwards.	5	5
Risorius	Aids smile with lateral pull	5	+ 2
Zygomaticus major	Elevates corners of mouth	5	3
Levator labii superioris	Raise upper lip	5	2
Depressor labii inferioris and platysma	Pulls lower lip down and outward	5	3
Mentalis	Pulls skin of chin upward	5	2
Depressor anguli oris	Pulls corner of mouth downward	5	3
Orbicularis oris	Whistling position of lips	5	3
Buccinator	Pulls corner of mouth backward and compresses cheek	5	3
Pterygoideus lateralis	Moves jaw sideways, both sides	5	3
Temporalis, masseter and pterygoideus medialis	Close jaw and bite firmly, show the teeth that are being clenched	5	4
Suprahyoid muscles	Depress lower jaw against resistance	5	+ 4
Orbicularis oculi	Close one eyelid at a time	5	1
Rectus medialis oculi and rectus lateralis oculi	Moves eyeball in horizontal plane , left and right side	5	5
Levator Palpabrae superioris et al.	Moves eyeball in vertical plane, Up and down	5	5
Infrahyoid muscles	Depress hyoid bone	5	+ 4

Table 36, Muscle strength test for face II [(1)]

Neurological reflex examination: [8] *Scale from 0-4*

Deep tendon reflexes	**Left**	**Right**
Brachioradialis (C6)	2	3
Triceps (C7)	2	3
Biceps (C5-C6)	2	3
Patellar (L2-L4)	0	0
Supra patellar	0	0
Achilles (L5-S1)	0	0

Table 37, Deep tendon reflexes II [8]

Superficial reflexes		**Left**	**Right**
Abdominal reflex	Epigastric	Slight contracture	Slight contracture
	Mesogastric	Slight contracture	Slight contracture
	Hypogastric	Not present	Not present

Table 38, Superficial reflexes II [8]

Abnormal reflexes	**Left**	**Right**
Babinski's sign	Negative	Negative
Chaddock's sign	Negative	Negative
Oppenheim's sign	Negative	Negative
Vitek's sign	Negative	Negative
Zukovsky- Kornylov	Negative	Negative
Rosselimo	Negative	Negative
Hoffmann's sign	Negative	Negative
Tromner's sign	Negative	Positive
Juster's sign	Negative	Negative
Mingazzini	Negative	Positive
Barrè	Negative	Negative
Rusisky	Patient can't provide supination and DF of wrist on right hand	

Table 39, Abnormal reflexes II [8]

Breathing pattern: [7]

By palpation patient has upper and lower thoracic breathing. She is able to breathe in abdominal region when stimulating by touch. She is also able to create a breathing wave in the 3 different regions.

Observation of movement pattern: [7]

Patient has practiced her routine where she now changes position from wheelchair to the bed and opposite from her right side.

Movement pattern from wheelchair to bed from right side of her body:

The bed is the same height at the wheelchair. She first turns the trunk so it will be possible for her to put the legs on the bed. She use her left hand to put both lower extremities on the bed, the right hand is free. Then she use both hands, right hand as a fist and palmar side of left hand on the surface of the bed, to shift herself slowly closer to the bed. When she is close enough she lifts her trunk from the wheelchair to the bed with the help of her hands. Her upper body is in flexion. When her whole trunk is on the bed, she moves into upright sitting position and correct her lower extremity with left hand while right hand remains like a fist on the surface of the bed as stabilization.

Movement pattern from bed to wheelchair from right side of her body:

Bed is in same height as the wheelchair. She turns her back to the chair and corrects her lower extremity so they will follow the direction she will move in. She uses both hands, right hand like a fist, to move her trunk close to the wheelchair. When she is close enough she lifts her trunk from the bed on to the chair. Then she flexes her elbow around the wheelchair handle which is behind her on the right side. This fixation prevents her from falling while she uses her left hand to take her lower extremity off the bed. At the end she let go of the wheelchair handle and corrects her position and legs.

Patient prefers to use only her left arm when dressing and undressing herself. But she has now exercised to use her right arm while dressing and undressing.

Movement pattern when dressing herself using right arm:

Patient dress her right arm first with her left hand and pull the t-shirt all the way up to the shoulder. Then she dresses her left arm using her right hand and pulls the t-shirt all the way up to her left shoulder. Then she uses only her right hand to pull the t-shirt down the head,

while the left arm is stabilizing the body by placing the hand on the surface of the bed. At the end she pulls the t-shirt with both hands down from the chest.

Movement pattern when undressing herself using right arm:
Patient grabs the t-shirt with both hands and pulls it up to chest height. Then the left hand undresses the right arm, and then the right arm undress the left arm. Now the t-shirt is around the neck. And patient use only her right hand to get the t-shirt over the head, while the left arm stabilize the body by having contact with the surface of the bed

5.12 Therapy effect evaluation

After been working with the patient for 8 days, I can only observe small improvements.
She cooperates better as well as she collaborates when given a task or exercise during a therapy session. She also seems more comfortable and relaxed and it is easier to work and exercise with her. But there is still hinders which stops her form remaining relaxed. When sudden pain occurs in her lower extremity, she contracts almost every muscles of upper body which annihilate the relaxation which was achieved.
After observing her daily routines, we decided to exercise and work on movement patterns which are most important in her case, such as wheelchair exercises, stabilization of right shoulder and scapula, moving from side lying position to sitting, changing position from bed to wheelchair and opposite from her right side, take t-shirt off and on while using right hand and also other active daily living tasks where she had to use fine movements of hand and fingers of right upper extremity. She was very negative to the idea at the beginning when we suggested that she had to keep her right arm in activity. But after each day, she was more conferrable using her right arm and hand.
Patients often struggled with pain and overstrain of her whole left arm and shoulder. In the last few days she was therefore complaining less about the left arm now that she started using her right one.
The patient's over all mobility of right upper extremity changes from day to day, therefore it is too soon to tell any difference or major change. But now that she has exercised techniques and tried out different ways where she has succeed and fulfilled tasks using the right upper extremity, she is now more open to the idea and voluntarily tries to use her hemiparetic side.

5.13 Prognosis

If the patient does not continue to use her right upper extremity the way we trained with her, she would not have any progress and continue to overload her left side of body and pain may even arias in spine. Her range of motion on hemiparetic side will remain decreased and muscles will be even harder to handle if she doesn't stretch them in elongated position. She also has to be more careful and be aware of her positions while sitting and laying. If she use correct techniques and exercise regularly, she would improve stability of both upper body and trunk. Because she spends most of the day sitting in wheelchair, it is also important to do small exercises for her whole upper body to try to prevent blockage of spine improve mobility of spine and ribs and also to enhance circulation.

While she was admitted at FNKV, we concentrated mainly on her upper extremity and hemiparesis. When we have achieved improvement in future, I would recommend therapy concentrated on her right side of face to obtain symmetry of both sides and also work on lower extremity to improve circulation.

Overall, the goal is to maintain her condition, not to seek full recovery for the hemiparesis, which is not possible. The aim is to make her daily life easier by making her use her body in a correct manner so she can avoid further destruction, pain and overload.

6. Conclusion

I choose the patient I wanted to write about in my Bachelor Thesis on the 2nd day of my practice. I thought it would be interesting to work with a patient with hemiparesis, which I have never experienced before. I got to use some techniques we only have learned theoretically about or preformed on healthy classmates. Since the patient had several diagnoses, I also found the practice challenging in a positive way. Also another important factor for my choice of patient was that the she had therapy 2 times a day, so that I got to practice and do therapy as much as possible.

The first day I only did observation and noticed how the patient was dealing with her body due to her diagnoses. I also had my first experience dealing with spasticity in general, which was interesting. Rest of the days I combined initial kinesiological examination and

the therapy for each day since there was a lot to examine because of her several diagnosis, but I mainly decided to concentrate on her hemiparesis. The first week I had guidance from my advisor since the patient used a wheelchair and therefore needed help and support. The second week I worked more independently with the patient.

The patient was very shy to speak at the beginning because we communicated in English, but she understood some English words and when we combined it with my poor Czech, she felt more conferrable to converse. If there were problems with the communication there was no problem to ask the other physiotherapist nearby for some translation. So I do not think there was a problem with communication or therapy applied during the practice. The patient was also calm and relaxed, and she was cooperative and helpful in all situations.

I was at the rehabilitation department for two weeks at Facultni nemocnice Kralovské Vinohrady. They had both in- and out-patients which gave me the opportunity to experience different variety of diagnoses and also gave me the chance to communicate with patients and learn how to handle each situation differently according to age, sex and each individual patient.

I also had the opportunity to work one day at the intensive care unit and I also had the experience of an ergotherapy session where I observe the lady I write about in this Bachelor Thesis.

After working 10 days at rehabilitation department I feel that I am more secure and confident about my knowledge and practical experiences. All the physiotherapists that worked there were great and learned me a lot. I am grateful that they trusted me enough to have patients on my own. As a sum up I have to say that I had a very knowledgeable experience at FNKV and I finally got the opportunity to use my theoretical and practical knowledge and be a part of treating patients with different diagnosis that I have never experienced before this practice.

7. List of literature

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8. List of figures

9. List of tables

10. Attachments

10.1 Abbreviations

ABD	Abduction
ADD	Adduction
ADL	Active daily living
BMI	Body mass index
C0/C1	The area between occipital bone and cervical vertebrae number one
C1	Cervical vertebrae nr one, Atlas
C2/3	The area between axis and cervical vertebrae
C/Th	The crossing between cervical spine and thoracic spine
DF	Dorsal flexion
DIP	Distal inter phalangeal
E	Extension
ER	External rotation
Ev	Eversion
F	Flexion
FNKV	Facultni nemocnice Kralovské Vinohrady
FTVS	Fakulta tělesné výchovy a sportu
Hor	Horizontal
IR	Internal Rotation
Iv	Iversion
L	Left
Lat	Lateral
LF	Lateral flexion
MCP	Meta carpo phalangeal
Opp	Opposition
PF	Palmar flexion
PIP	Proximal inter phalangeal
PIR	Post isometric relaxation
PNF	Proprioceptive neuromuscular facilitation
Pron	Pronation
R	Right

RD	Radial duction
RDev	Radial deviation
Rot	Rotation
SCM	Sternocleidomastoid
Sup	Supinatination
UD	Ulnar duction
Udev	Ulnar deviation